

**1020™  
COLOR PRINTER  
FIELD SERVICE  
MANUAL**

ATARI®



© 1983 Atari Inc. A Warner Communications Company

FD100288  
Rev. 01  
August 1983

COPYRIGHT © 1983 BY ATARI, INC. ALL RIGHTS RESERVED

No part of this publication may be reproduced by any mechanical, photographic, or electronic process, or in the form of a phonographic recording, nor may it be stored in a retrieval system, transmitted, or otherwise copied for public or private use, without permission from ATARI, Inc.

Published By:

**Atari, Inc.**

1265 Borregas Avenue

P. O. Box 427

Sunnyvale, California 94086

U.S. America

ATARI

1020<sup>TM</sup> Color Printer

Field Service Manual

Atari believes that the information described in this manual is accurate and reliable, and much care has been taken in its preparation. However, no responsibility, financial or otherwise, shall be accepted for any consequences arising out of the use of this material. Information contained herein is subject to change. Revisions may be issued to advise of such changes and/or additions.

Correspondence regarding this document should be forwarded to Director of Technical Support, Consumer Product Service, Atari, Incorporated, 845 W. Maude Avenue, Sunnyvale, CA 94086.

## TABLE OF CONTENTS

<u>Section</u>	<u>Title</u>	<u>Page</u>
	INTRODUCTION	vii
1	THEORY OF OPERATION	1-1
	Overview	1-1
	User Interface	1-3
	Mechanical	1-4
	Case	1-4
	Frame	1-7
	Print Head Mechanism	1-7
	Paper Feed Mechanism	1-7
	Pen Up-Down Mechanism	1-7
	Pen-up State	1-7
	Pen-down State	1-7
	Color Change Mechanism	1-7
	Pen Ejection Mechanism	1-8
	Detection Mechanism for	
	Color Position and Home	
	Position	1-8
	Electronic	1-8
	Power Supply Circuit	1-8
	Noise Limit Capacitors	1-9
	Serial/Parallel Microprocessor (A1)	
	Circuit	1-9
	Printer Controller Microprocessor (A2)	
	Circuit	1-10
	Print Head Motor and	
	Paper Feed Motor Drive Circuit	1-10
	Pen Up-Down Solenoid	
	Drive Circuit	1-10
	Color Detect Switch Circuit	1-12
	Paper Feed Switch Circuit	1-12
	Color Change Switch Circuit	1-12
	Pen Change Switch Circuit	1-12
	Power ON Reset Circuit	1-12
	Oscillator Circuits	1-12
2	SCHEMATICS & SILKSCREENS (attached to front cover)	2-1
3	TESTING	3-1
	Equipment Required	3-1
	Diagnostic Procedure	3-1
	Setting up the 1020 for testing	
	and using CPS Diagnostic Diskette	
	with file T1020.BAS	3-1
	Internal Test	3-6
	Operator Test	3-6
	Pen Up-Down Troubleshooting Program	3-7
	Print Head (Carriage) Motor	
	Troubleshooting Program	3-7

<u>Section</u>	<u>Title</u>	<u>Page</u>
	Paper Feed (Platen)	
	Motor Troubleshooting Program	3-8
	Specific Command Code Failures	3-10
4	DIAGNOSTIC FLOWCHARTS	4-1
	Overview	4-1
	Swapout Procedure	4-1
	Replace In Order	4-1
	Atari Repair Hotline	4-1
5	SYMPTOM CHECKLIST	5-1
6	DISASSEMBLY/ASSEMBLY	6-1
	Equipment Required	6-1
	Preventive Maintenance	6-1
	Adjustments	6-1
	Disassembly	6-4
	Case Disassembly/Switch Assembly	
	Removal	6-4
	Printer Module Removal	6-4
	Electromagnet Assembly (Solenoid)	
	Removal and Replacement	6-5
	Actuator and Coupling Lever	
	Adjustment	6-5
	Pen and Paper Platen Adjustment	6-6
	Reed Switch Removal and Replacement	6-7
	Color Change Click Removal and	
	Replacement	6-7
	Motor Cover, Print Head Motor and Paper	
	Feed Motor Removal and Replacement	6-8
	Rotary Pen Holder Removal and	
	Replacement	6-9
	Stopper Click Removal and Replacement	6-9
	Paper Feed Idle Gear Removal and	
	Replacement	6-10
	Ejection Lever Spring Removal and	
	Replacement	6-10
	Paper Holding Roller (Upper) Removal	
	and Replacement	6-10
	Print Head Idle Gear Removal and	
	Replacement	6-11
	PC Board Removal	6-11
	Assembly	6-12
	PC Board Replacement	6-12
	Printer Module Replacement	6-12
	Switch Assembly Replacement/Case	
	Assembly	6-12
7	PARTS LIST	7-1
8	SERVICE BULLETINS	8-1

## LIST OF ILLUSTRATIONS

<u>Figure</u>	<u>Title</u>	<u>Page</u>
1-1	1020 Color Printer Block Diagram	1-2
1-2	1020 Color Printer Front View	1-3
1-3	1020 Color Printer Back View	1-4
1-4	1020 Color Printer Final Assembly	1-5
1-5	1020 Color Printer Mechanical Assembly	1-6
1-6	Power Supply Circuit	1-9
1-7	Pen-Up Circuit	1-11
1-8	Pen-Down Circuit	1-11
2-1	1020 Color Printer Silkscreen	2-3
2-2	1020 Color Printer Schematic	2-5
3-1	CPS Diagnostic Diskette Sample Printout (Text Mode)	3-4
3-2	CPS Diagnostic Diskette Sample Printout (Graphic mode)	3-5
3-3	Internal Test Sample printout	3-6
3-4	Operator Test Sample Printout	3-10
6-1	1020 Color Printer Mechanical Assembly	6-2
6-2	1020 Color Printer Final Assembly	6-3
6-3	Actuator/Coupling Lever Adjustment	6-6
6-4	Pen and Paper Platen Adjustment	6-6
6-5	Motor Cover Removal	6-8

## LIST OF TABLES

<u>Table</u>	<u>Title</u>	<u>Page</u>
3-1	Character Command Code Table	3-9
4-1	Pen Up-Down Transistor Check	4-6





## INTRODUCTION

The Atari 1020<sup>TM</sup> Color Printer Field Service Manual is a reference guide for the service technician. The information presented in this manual, when used in conjunction with ATARI training, enables you to repair and maintain the 1020 Color Printer.

This Field Service Manual is organized in eight sections:

- **THEORY OF OPERATION** - Overview of how the 1020 Color Printer works and what its basic assemblies look like.
- **SCHEMATICS AND SILKSCREENS** - Printed Circuit Board layout and electrical drawing.
- **TESTING** - Review of tests available for diagnosing 1020 Color Printer problems.
- **DIAGNOSTIC FLOWCHARTS** - Aids for troubleshooting the 1020 Color Printer.
- **SYMPTOM CHECKLIST** - Failure information to assist the experienced technician arrive at a rapid diagnosis of 1020 Color Printer problems.
- **DISASSEMBLY/ASSEMBLY** - Procedures for disassembling and assembling the 1020 Color Printer.
- **PARTS LIST** - Breakdown of parts used to repair the 1020 Color Printer.
- **SERVICE BULLETINS** - Section to be used to hold Field Change Orders, Upgrade Bulletins and Tech Tips.



## SECTION 1

### THEORY OF OPERATION

#### OVERVIEW

The ATARI 1020 Color Printer is a free-standing, 40-column, 4-color printer that averages 12 characters per second and provides graphics and ATASCII character printout. It is a hard copy output peripheral intended for use under the control of the ATARI 400<sup>TM</sup>, 800<sup>TM</sup> or 1200XL<sup>TM</sup> computer. It connects directly to the SIO peripheral port of the computer (no interface is required). The printer mechanism is an X-Y plotter which uses ballpoint pens as its writing instruments. All firmware is resident in the printer and executed by an on-board microprocessor which controls the functions of the printer.

Figure 1-1 is a block diagram of the functional flow of the 1020.

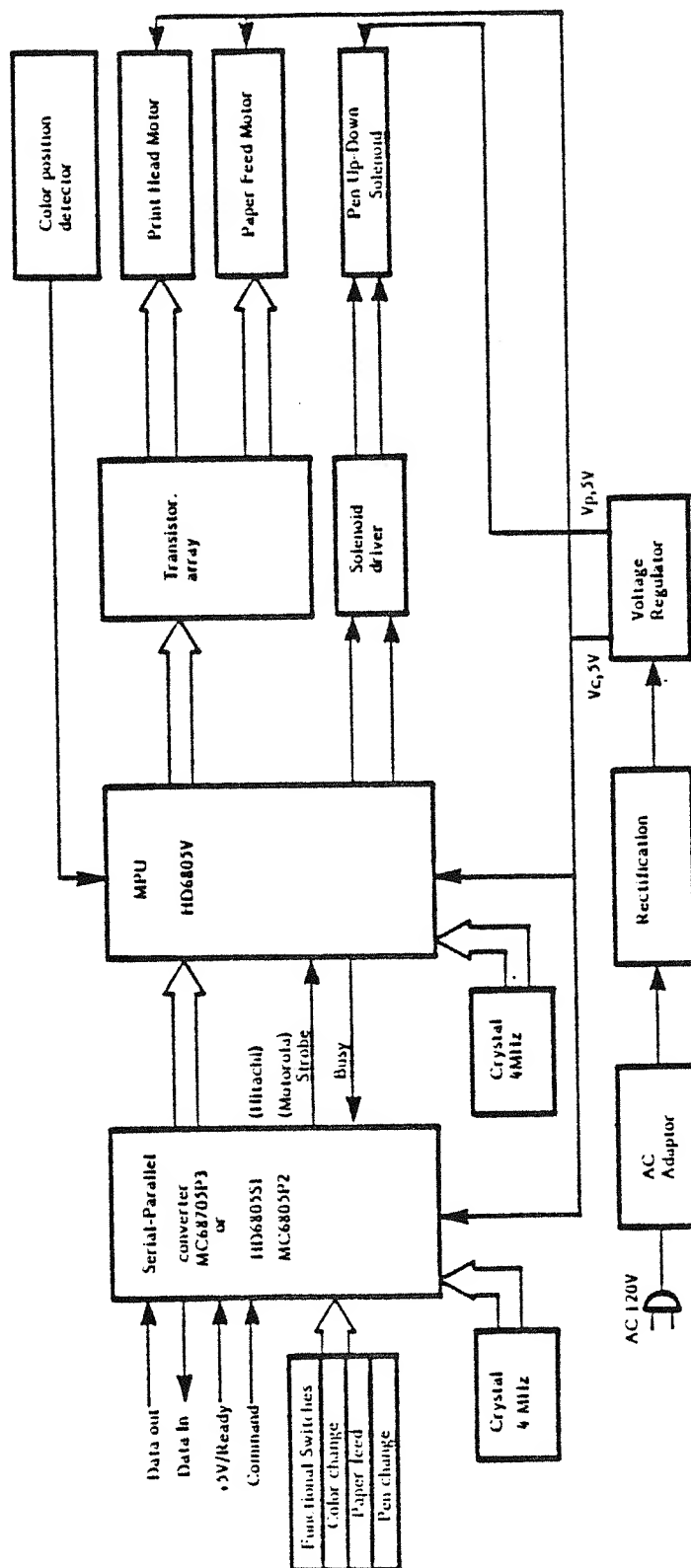


Figure 1-1. 1020 Color Printer Block Diagram

## USER INTERFACE

The Controls/Indicators are located on the front and back panels of the 1020. The front panel contains the four manual (function) buttons and the LED which indicates that power to the unit is ON (see Figure 1-2).

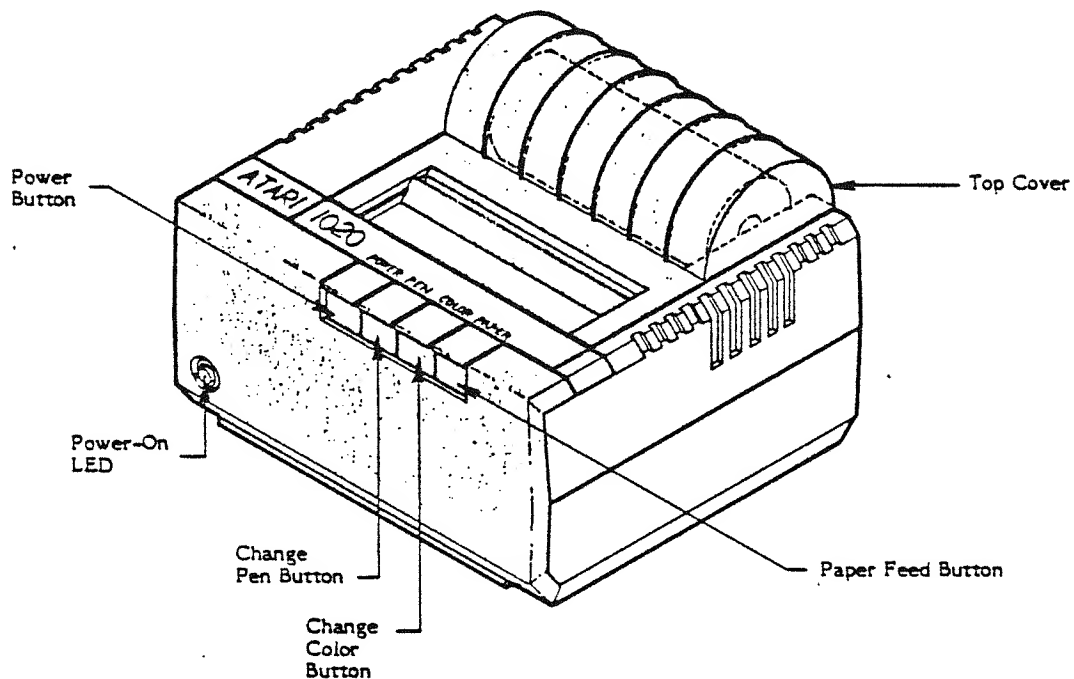


Figure 1-2. 1020 Color Printer Front View

From left to right the manual buttons and their functions are:

- POWER** - The microprocessor is reset when the POWER button is pressed.
- PEN** - This allows the pen to be changed. When this button is pressed, the carriage moves to the right, then stops. The pen can be taken out by operating the pen eject lever located at the right front of the unit.
- COLOR** - When this button is pressed, the rotary pen holder moves to the next color position.
- PAPER** - Paper is fed when this button is pressed.

The back panel contains two Input/Output (I/O) connectors and the Power Input Jack (see Figure 1-3).

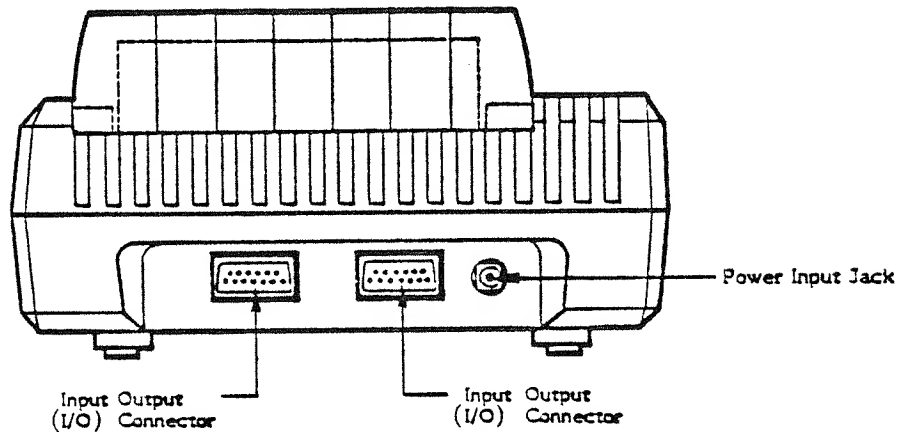


Figure 1-3. 1020 Color Printer Back View

## MECHANICAL

This section describes the mechanical characteristics of the 1020 Color Printer. For an overall understanding of the 1020 printer operation, read both this section and the Electronic section which follows it.

### Case

The outer case is composed of four pieces of plastic. The pieces are 1) the upper case; 2) the lower case; 3) the front bezel; and , 4) the top cover.

Use Figure 1-4 and Figure 1-5 as reference for the following discussion.

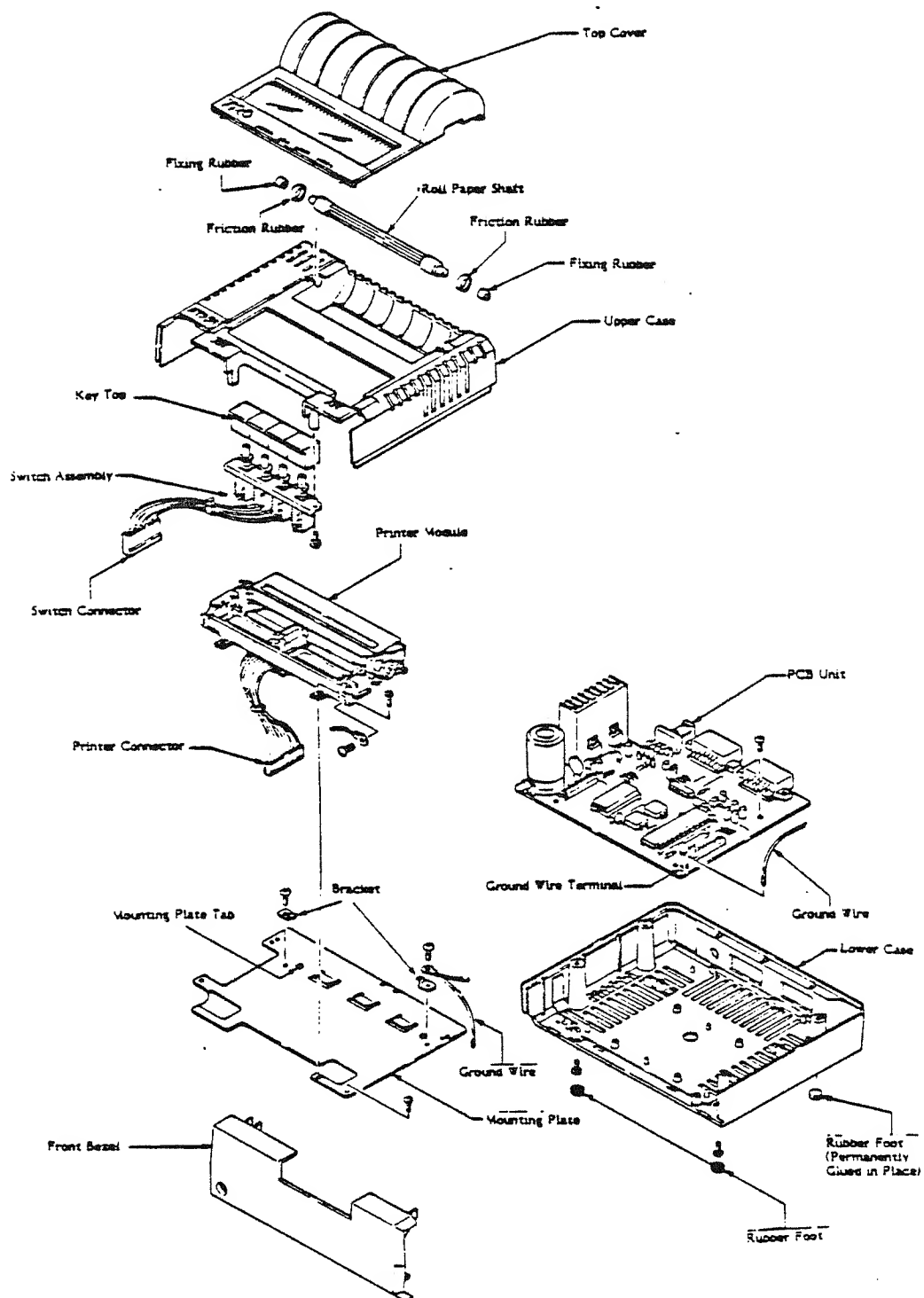


Figure 1-4. 1020 Color Printer Final Assembly





## Frame

The frame has a side frame unit (right), side frame unit (left), mounting plate, and paper guide. The lower edge of the frame, bent in the shape of the letter L, acts as a mounting leg.

## Print Head Mechanism

The Print Head mechanism consists of the Print Head motor, the idle gear, the bobbin gear, the pulley support base (left), the pulley support base (right), the slider unit and wire. The Print Head motor motion is transmitted to the bobbin gear via the idle gear and to the slider unit by a wire. The wire tension is maintained by a coil spring.

## Paper Feed Mechanism

The Paper Feed mechanism consists of the Paper Feed motor, the idle gear, the platen, the paper holding roller (right) and the paper holding roller (left). The Paper Feed motor motion is transmitted to the platen via the double idle gear.

## Pen Up-Down Mechanism

The pen up-down mechanism consists of the electromagnet (solenoid) assembly (actuator, actuator spring, coupling lever and permanent magnet), an ejection lever, a roller lever, and four ballpoint pens. The up-down position of the pen is determined by the direction of the electric current going through the electromagnet assembly.

### **Pen-up State (pen off paper/no write):**

The condition when the actuator is open (and the pen is lifted from the paper) is called the pen-up state. This state is held by the actuator spring over-riding the pen down pressure of the ejection lever spring. The open position of the actuator is limited by the stopper screw.

### **Pen-down State (pen on paper/write);**

A 5.4 msec impulse in the pen-down direction attracts the actuator, causing the pen-down state. Under this state, the force of the permanent magnet is greater than the actuator spring. This condition is maintained by the permanent magnet after the power is cut. The pen pressure on the paper is maintained by the ejection lever spring. During the pen-down state, there should be clearance between the actuator and the coupling lever.

## Color Change Mechanism

The color change mechanism consists of the Print Head drive mechanism, the rotary pen holder, the slider unit, and the projection on the left side frame unit. The operating principle is:

- The slider moves to carriage left.
- By repeating the movement of the Print Head motor for 30 pulses to the left, pen 1 changes to pen 2.

### Pen Ejection Mechanism

The pen ejection mechanism consists of the pen ejection lever mounted on the side plate (right). The slider unit moves to the side plate (right) and stops. Pull the pen ejection lever forward, and the pen ejects.

### Detection Mechanism for Color Position and Home Position

A magnet is built into one part of the rotary pen holder. A reed switch is placed on the left side of the frame unit. The switch is turned on when the pen holder repeats a color change operation and the magnet comes close to detect the home position of the color location.

### ELECTRONIC

The 1020 Color Printer Electronics consists of 12 elements which are discussed in the following paragraphs:

- the Power Supply Circuit
- the Noise Limit Capacitors
- the Serial/Parallel Microprocessor (A1) Circuit
- the Printer Controller Microprocessor (A2) Circuit
- the Print Head and Paper Feed Motor Drive Circuit
- the Pen Up-Down Solenoid Drive Circuit
- the Color Detect Switch Circuit
- the Paper Feed Switch Circuit
- the Color Change Switch Circuit
- the Pen Change Switch Circuit
- the Power ON Reset Circuit
- the Oscillator Circuits

**NOTE:** Electromagnet Assembly and solenoid refer to the same assembly.

### Power Supply Circuit

The unit is powered with an external AC Adaptor. The AC voltage is stepped down in the adaptor. The voltage is internally rectified by a diode bridge (D1-D4), smoothed by capacitors and regulated by voltage regulators (A5 & A6) to obtain a stable power output. The Power ON-OFF switch completes the AC circuit to the bridge rectifier.

The Power Supply provides the following voltages for use in the system:

- Vc 5V+/- 5% for driving the motor and control circuits
- Vp 5V+/- 5% for driving the pen up-down solenoid



Figure 1-6 illustrates the Power Supply Circuit.

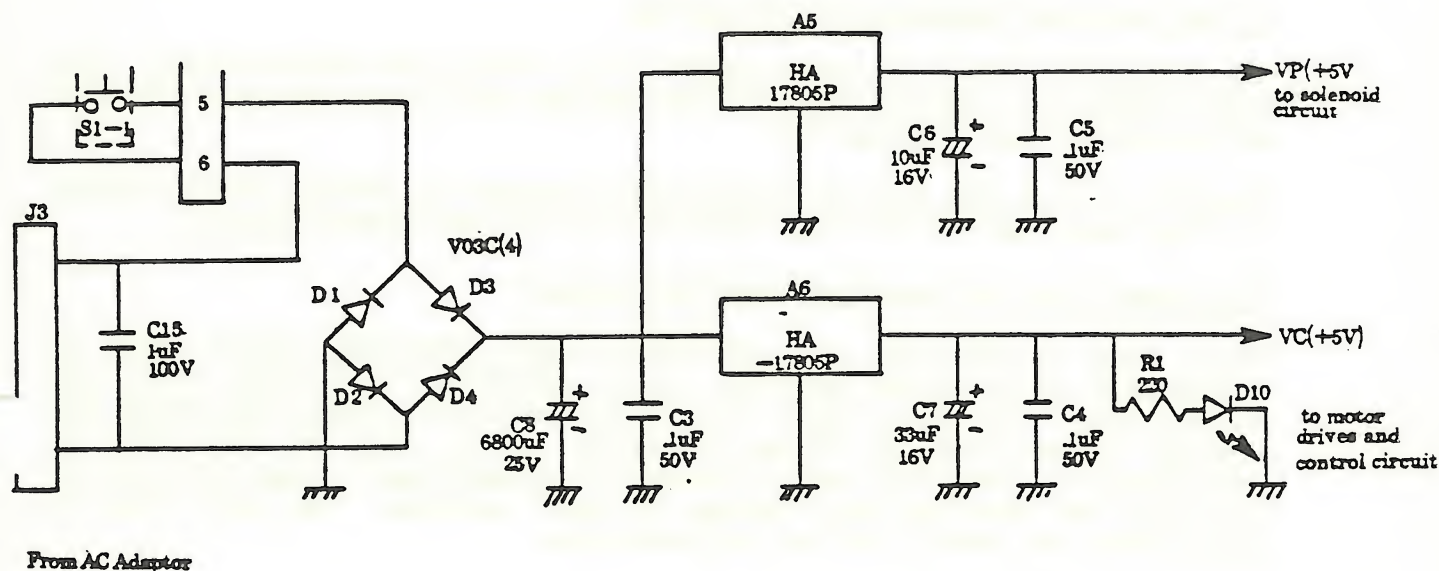


Figure 1-6. Power Supply Circuit

#### Noise Limit Capacitors

In order to suppress induction noise to the power line, a 1uF film capacitor (C15) is attached to the secondary AC circuit and 0.1uF ceramic capacitors (C9, C10 & C11) are used near the power terminal of IC's A1, A2 and A3. In addition, capacitors (C4 & C5) are on each output leg of the Power Supply (C4 - Vc; C5 - Vp).

#### Serial/Parallel Microprocessor (A1) Circuit

Data communication with the computer is made via a 19,200 bps serial system. The DATA OUT terminal is the output terminal from the computer which is, at the same time, the input terminal for the printer unit. Similarly, the DATA IN terminal is the output terminal from the printer unit. The COMMAND terminal is the output from the computer, indicating that transmitted data are commands.

Data transmitted from the computer is converted to parallel data and transferred to the Printer Controller microprocessor.

The serial/parallel converter uses an NMOS, 8-bit, one-chip microprocessor which operates with a clock frequency of 4MHz controlled with an external quartz crystal (X1).

#### Brief Description of Serial Port Signals:

- |    |          |  |
|----|----------|--|
| 3. | DATA IN  | - 19,200 Baud data line to the computer (from printer) |
| 4. | GND      | - Ground (Digital Common)                              |
| 5. | DATA OUT | - 19,200 Baud data line from the computer (to printer) |
| 6. | GND      | - Ground (Digital Common)                              |

- 7. COMMAND - Goes to zero when a command frame is being sent
- 10. +5V/READY - Indicates that the computer is turned on and ready.  
Restricted use as a +5 volt supply.

#### Printer Controller Microprocessor (A2) Circuit

This is the heart of the unit which consists of an NMOS, 8-bit microprocessor. The built-in ROM has a capacity of 4k bits and operates with a clock frequency of 4MHz with an external quartz crystal (X2).

The MPU receives data from the serial/parallel converter and decodes them to control the Print Head Motor and the Paper Feed Motor and the pen up-down solenoid.

#### Print Head Motor and Paper Feed Motor Drive Circuit

Motor driver LB1257 (A3) is a monolithic digital integrated circuit which is encapsulated in an 18-pin package. It is conductive to a phase where the microprocessor terminal is "High". The Print Head and the Paper Feed motor are stepping motors driven by 2-phase excitation. Basic clock of each motor is approximately 4 msec which may be increased by approximately 1 msec when data is input from the interface circuit during the motor operation. The motor power is supplied from the same Vc (+5V) as the circuit drive.

#### Pen Up-Down Solenoid Drive Circuit

Up-Down of the ball point pen is controlled from C0 and C1 terminals of the microprocessor so that Pen UP or DOWN status is held thereafter by giving a single pulse input of approximately 5.4 msec.

Up-Down action of the solenoid is determined by the current direction in the solenoid.

The Pen-Up current flows as (See Figure 1-7):

Vp → Transistor Q6 → Solenoid Pen Down Terminal (No. 13) →  
Solenoid Pen Up Terminal (No. 12) → Transistor Q5 → Gnd

The Pen-Down current flows as (See Figure 1-8):

Vp → Transistor Q7 → Solenoid Pen UP Terminal (No. 12) →  
Solenoid Pen DOWN Terminal (No. 13) → Transistor Q4 → Gnd

Transistor Q3 is to force transistor Q7 to be OFF when both C0 and C1 terminals output signals simultaneously for any cause. A surge voltage generated at the solenoid ON/OFF is suppressed to approximately 16V by the bridge circuit which consists of diodes D9 through D6 and a zener diode D7. The solenoid drive power is supplied from Vp (5V).



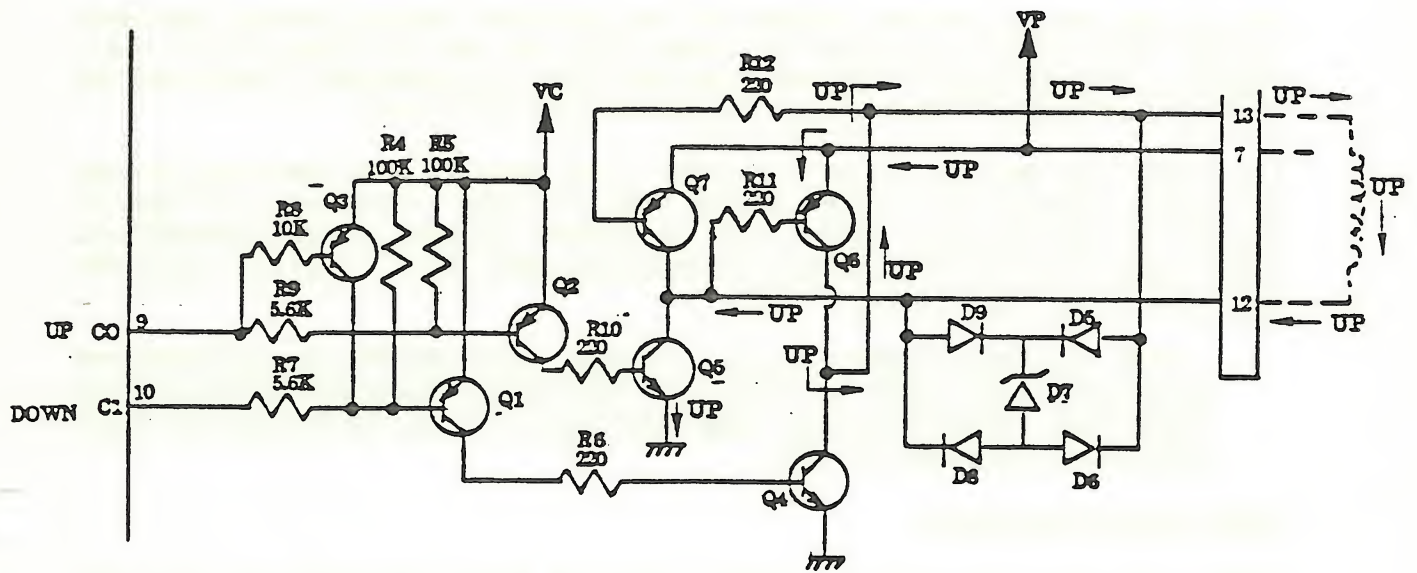


Figure 1-7. Pen-Up Circuit

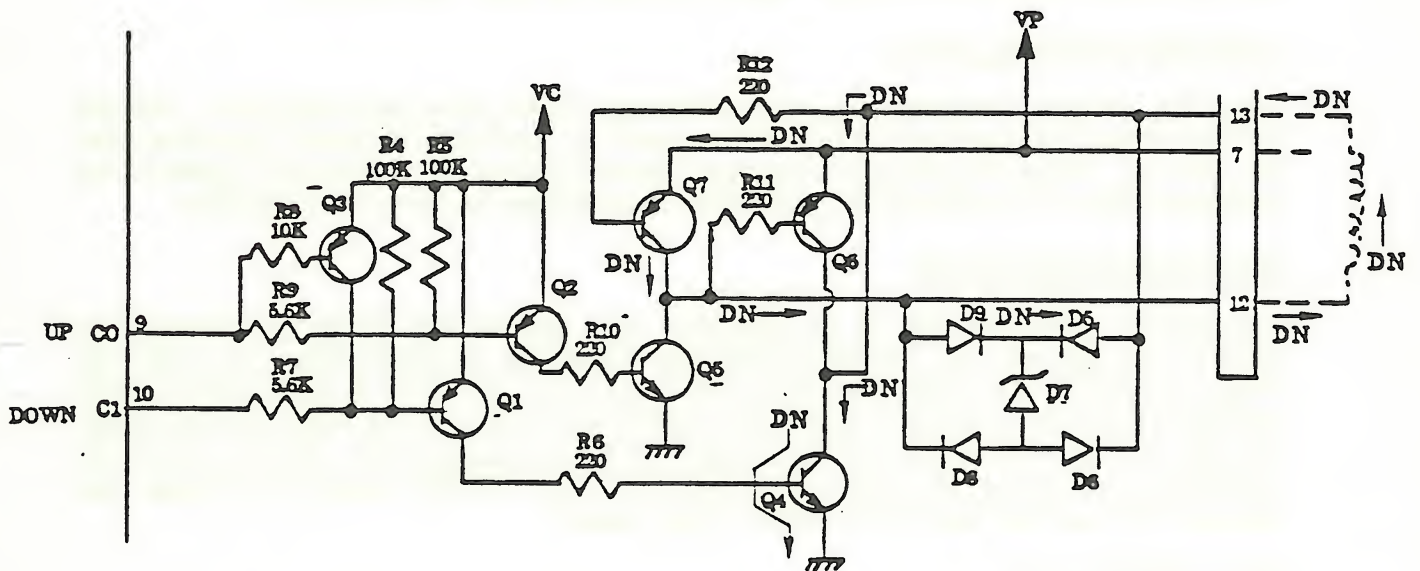


Figure 1-8. Pen-Down Circuit

### Color Detect Switch Circuit

This switch detects the home position of the pen holder during a printer head color change. The circuit is composed of a reed switch (on the side frame (left)) and a magnet (in the pen holder). One end of the reed switch is connected to Ground and the other to the microprocessor (A2, pin 12) and Vc via R6 (10K ohms).

The printer head carriage moves to the left. If the pen holder is at the home position, the magnet attached to it causes the reed switch to make. As a result, +5V goes to Ground, the microprocessor senses a low and detects the color change home position. If the magnet is not at home position, the microprocessor senses a high and causes the pen holder to continue rotating.

**NOTE:** The Paper Feed Switch, Color Change Switch and Pen Change Switch are unworkable unless input data array ends with CR (Carriage Return) or LF (Line Feed) code. When the printer stops under such a status, the switches are made workable by inputting CR code.

### Paper Feed Switch Circuit

Paper is fed when this switch is pressed. When the Paper Feed switch and the Color Change switch are pressed simultaneously, software reset works to set the printer to the text mode and the carriage moves to the left end. One end of this switch is connected to Ground and the other to the Serial/Parallel Converter microprocessor (A1, Pin 15). When this switch is pressed, the switch makes, a low signal goes to the Serial/Parallel converter microprocessor, causing the paper feed action.

### Color Change Switch Circuit

When this switch is pressed, pen color is changed to the next color position. One end of this switch is connected to Ground and other to the Serial/Parallel microprocessor (A1, Pin 14). When this switch is pressed, the switch makes, a low signal goes to the microprocessor (A1), causing the pen holder to rotate to the next color position.

### Pen Change Switch Circuit

This switch allows the pen to be changed. One end of this switch is connected to Ground and the other to the Serial/Parallel Converter microprocessor (A1, Pin 16). When this switch is pressed, the switch makes, a low signal goes to the Serial/Parallel microprocessor (A1, pin 16), causing the carriage to move to the right end and stop. The pen can be removed by pulling forward on the pen eject lever. Return to normal operation by pressing the paper feed switch. If the COLOR switch is pressed, pen change action occurs again after color change action.

### Power ON Reset Circuit

When the printer power switch is turned on, the microprocessor is reset internally by the function of C13 (A2) and C14 (A1) to Ground.

### Oscillator Circuits

The Serial/Parallel microprocessor (A1) and the Printer Controller microprocessor (A2) each incorporates a quartz oscillator (X1 & X2) which determines the operation frequency (4MHz +/- 700 Hz).

## SECTION 2

### SILKSCREENS AND SCHEMATICS

Attached to the front cover are representative silkscreens and schematics for the 1020. Remove them and place them in this section. Minor variations in design may be encountered depending on the production date of the unit, but these schematics provide all details required for an in-depth understanding of all 1020 Color Printer units.





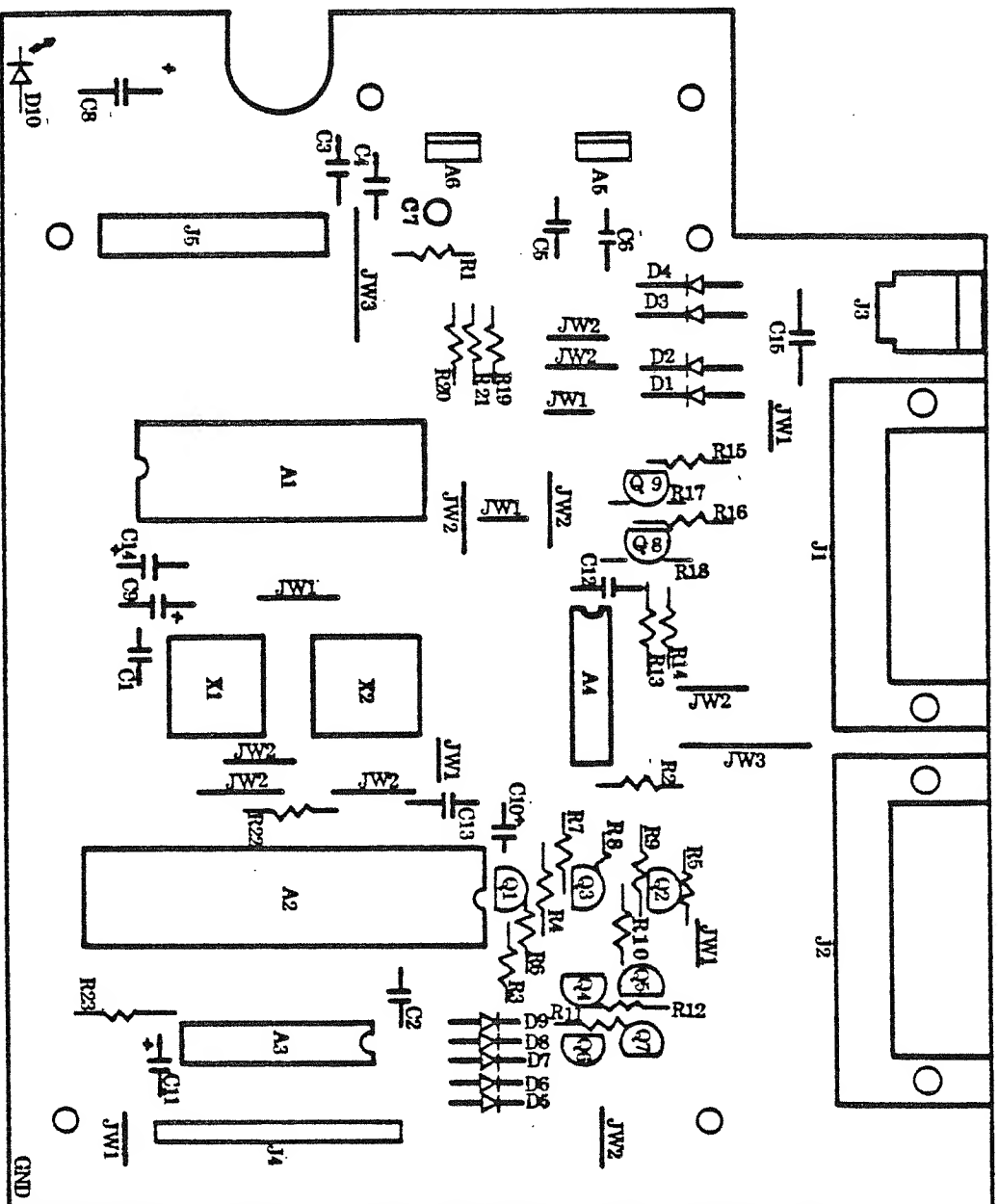


Figure 2-1. 1020 Color Printer Silkscreen.



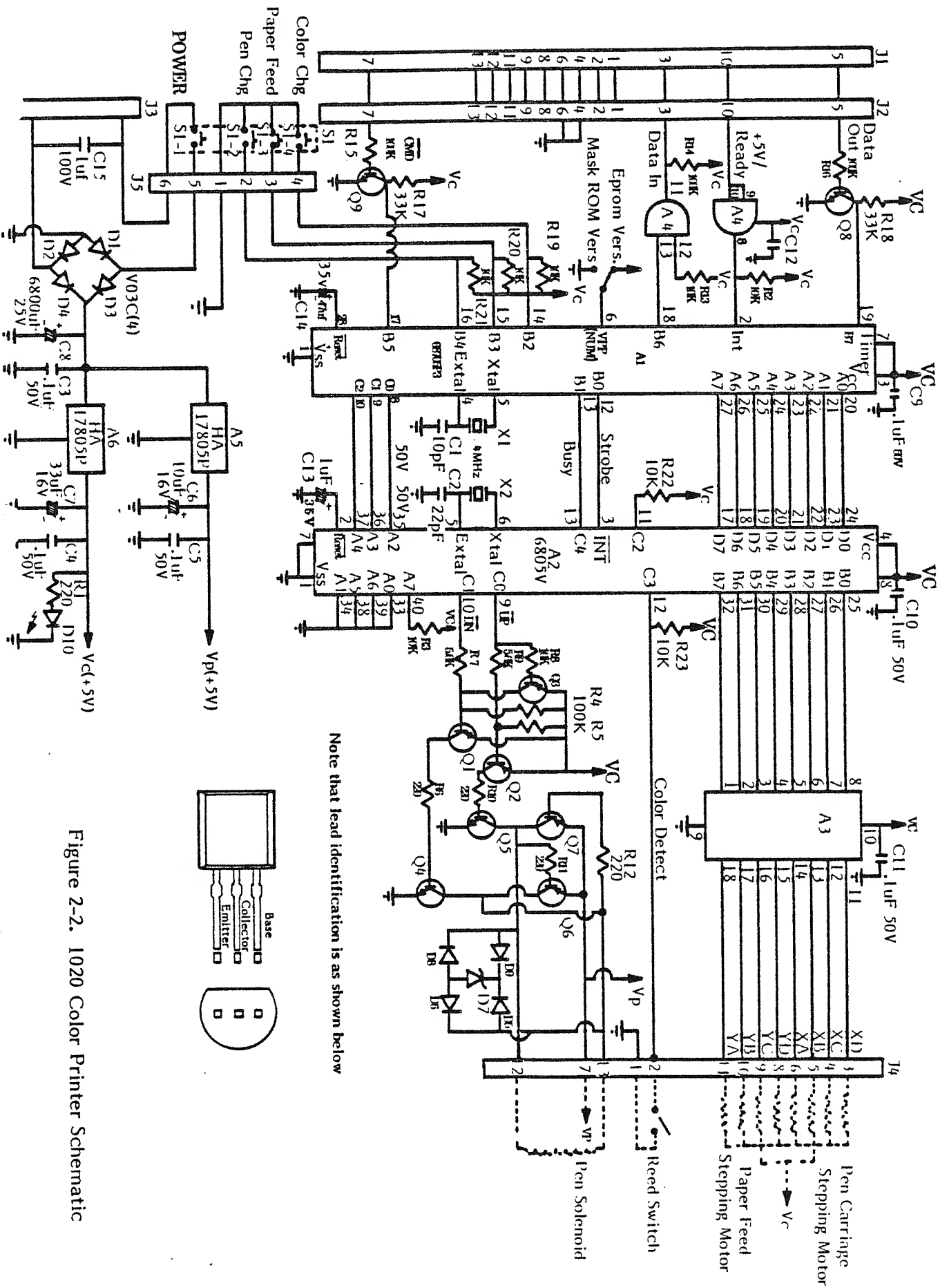


Figure 2-2. 1020 Color Printer Schematic



## SECTION 3

### TESTING

#### Equipment Required

- An Atari Computer and accessories
- A BASIC language cartridge
- CPS Diagnostic Diskette with the file T1020.BAS (FD100577)
- A Jewelers screwdriver kit
- A Standard tool kit
- A Volt/Ohmmeter
- A 15 MHz oscilloscope

#### Diagnostic Procedure

The testing procedures available for the 1020 are:

- An Internal Test which occurs at Initial Power-Up
- CPS Diagnostic Diskette with the file T1020.BAS
- An Operator Test which consists of a BASIC Program which you will type in. This test should be used only if CPS Diagnostic Diskette with the file T1020.BAS is not available.

The following pages explain how to set up the 1020 for testing and contain procedures and sample printouts for each test.

#### Setting up the 1020 for testing and using CPS Diagnostic Diskette with the file T1020.BAS

1. Connect the computer to the TV set as shown in the computer owner's manual.
2. Plug the 1020 into the power adaptor.
3. Plug an I/O cable into the computer and the 1020.
4. Connect the disk drive to the computer as shown in the owner's manual.
5. Power up the 1020 Printer. The Internal Test occurs when power is supplied to the 1020.
6. Power up the disk drive. Wait for the disk drive to complete its initialization.
7. Insert the CPS Diagnostic Diskette with the file T1020.BAS into the disk drive and close the door.
8. Insert the BASIC cartridge into the computer (if applicable).\*

\*NOTE: This program requires the use of BASIC to execute, later model computers may have BASIC already installed.

9. Power up the computer. Wait for the computer to complete its initialization. Display device should exhibit "READY" in white letters on a blue background.
10. Enter the command RUN "D1:T1020.BAS" and terminate with the RETURN key.
11. The program will now load and execute.
12. The following menu appears:

Test Facility  
for the  
1020 Plotter/Printer

Rev 1

- 1) All Function Test
- 2) Pen Up/Down
- 3) Platen Up/Down
- 4) Draw Right/Left
- 5) Pen Change

Q) Stop test and return to menu

Please Select an Option

Select 1) for the printout illustrated in Figure 3-1 and Figure 3-2.

Select 2) to provide a signal for Pen Up/Down troubleshooting. The printout for this option is a straight line drawn across the page.

Select 3) for Platen Up-Down operation.

The following menu appears:

Selection Test  
Options for The  
1020 Plotter/Printer

- 1) Platen Up
- 2) Platen Down
- 3) Return to Exec Menu

Q) Stop test and return to menu.

Please Select an Option

NOTE: Platen-Up spins the paper roll forward; Platen-Down reverses the paper roll. Platen-Up pulls the paper in when paper is loaded. To avoid paper waste, execute Platen-Down or remove paper when executing Platen-Up.

Select 4) to move the carriage right and left.

NOTE: The carriage should go to the right, then to the left. It may stop at this point. You may have to restart this test in order to continue.

Select 5) to rotate the rotary pen holder.

The following menu appears:

- 1) Change in increments of 1
  - 2) Change in increments of 2
  - 3) Change in increments of 3
  - 4) Return to Exec Menu
  
  - Q) Stop Test and Return to Menu
- Please Select an Option

NOTE: Option 3 rotates the pen holder in the following sequence: holder rotates 3 increments, then rotates 1 increment (to return to Home Position). This is normal operation for this option and not a problem in your printer.





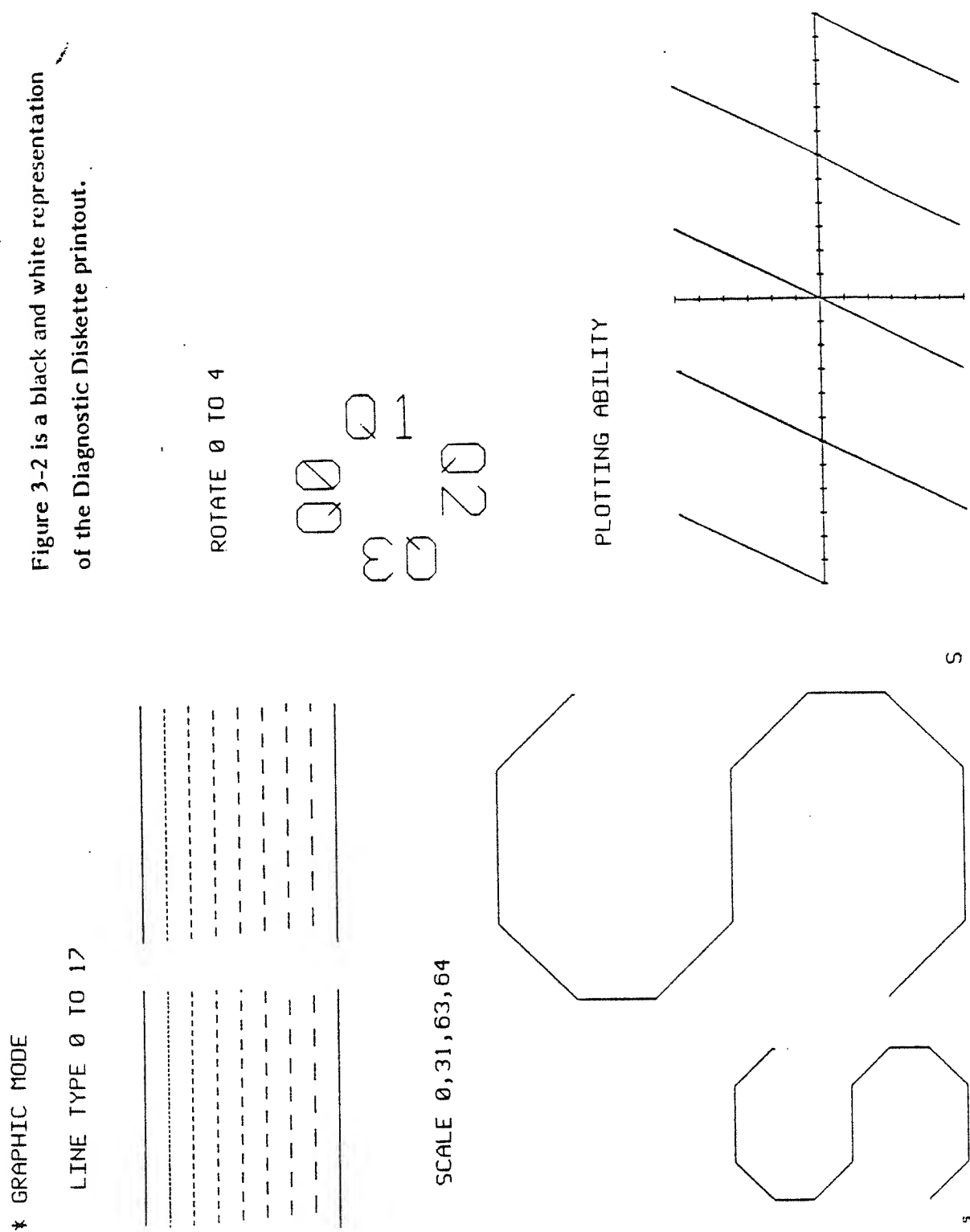


Figure 3-2. CPS Diagnostic Diskette sample printout (graphic mode)

### Internal Test

- 1) Press the POWER switch on the 1020. The switch should stay down and the LED should come on.
- 2) The print head should move to the far left, stop there for 2-3 seconds then draw four colored boxes on the screen (see Figure 3-3).
- 3) The print head should then stop near the left margin.

Figure 3-3 is a black and white representation of the Internal Test printout.



Figure 3-3. Internal Test Sample Printout

### Operator Test

**NOTE:** Use only if CPS Diagnostic Diskette with the file T1020.BAS is not available.

The 1020 has several different command codes. During this test we will test the major character types. If the customer complains of other character types not working, check page 3-10.

**NOTE:** It is possible you may enter the wrong command. Before Troubleshooting, be sure that you made the correct entries.

To test the 1020:

1. Type in the following program in BASIC, making sure that you press the RETURN key after each line that you type in. If you receive an ERROR message after pressing RETURN, retype the line making sure that it is typed exactly like the model at the top of page 3-7.

```

10 OPEN #1,8,0,"P"
20 DIM A$(8)
30 ? #1: ? #1
40 INPUT A$
50 IF A$="SKIP" THEN GOTO 30
60 ? #1;A$
70 FOR X=0 TO 126
80 IF X=27 THEN 100
90 ? #1;CHR$(X);
100 NEXT X
110 ? #1;CHR$(127)
120 GOTO 40

```

2. Type RUN and press RETURN.
3. A question mark will appear on the screen asking you for the command code.
4. When the computer is ready to accept a command the white cursor appears to the right of the question mark. When the instructions tell you to type in a certain code, refer to the Character Command Code Table (Table 3-1) on page 3-9.
5. The above program checks text mode. For Pen Up-Down Troubleshooting, Print Head (Carriage) Motor Troubleshooting or Paper-Feed (Platen) Motor Troubleshooting, use the following instructions.

#### Pen Up-Down Troubleshooting Program

Use above program with (See Table 3-1): 80 Columns per line  
Enable International character set

This provides rapid pen up/down movement.

To repeat test, press RETURN.

#### Print Head (Carriage) Motor Troubleshooting Program

Enter the following. Remember to press RETURN at the end of each line.

```

10 OPEN #1,8,0,"P"
20 ?#1;" ESCAPE, ESCAPE, CONTROL G"*
30 ?#1;"M480,0;0,0
40 GOTO 30

```

Type RUN and press RETURN.

To stop program, press <BREAK>

\*Press the CONTROL key and the letter key at the same time.

### Paper Feed (Platen) Motor Troubleshooting Program

Enter the following. Remember to press RETURN at the end of each line.

```
10 OPEN #1,8,0,"P"  
20 ?#1;" ESCAPE, ESCAPE, CONTROL G"*  
30 ?#1;"M0,999;0,-999  
40 GOTO 30
```

Type RUN and press RETURN.

To stop program, press<BREAK>

**TABLE 3-1**  
**CHARACTER COMMAND CODE TABLE**

**TEXT MODE:**

<u>YOU TYPE IN</u>	<u>FUNCTION</u>
ESCAPE, ESCAPE, CONTROL P *	20 column printing
ESCAPE, ESCAPE, CONTROL S *	80 column printing
ESCAPE, ESCAPE, CONTROL N *	40 column printing (normal)
ESCAPE, ESCAPE, CONTROL W *	Enable International Char. Set.
ESCAPE, ESCAPE, CONTROL X *	Disable International Char. Set.

**GRAPHICS MODE:**

<u>YOU TYPE IN</u>	<u>FUNCTION</u>
ESCAPE, ESCAPE, CONTROL G *	Enter Graphics Mode
?#1;"A"	Return to Text Mode.
?#1;"MX,Y"	Move Cursor

\*Press the CONTROL key and the letter key at the same time.

When entering the character command codes, do not insert spaces or commas between the commands or press RETURN. Type them in consecutively on the screen.

**NOTE:** The maximum number of characters that can be entered is eight.

Although you press the ESCAPE key twice, only one character appears on the screen.

6. Press RETURN. The printer prints the default character set.
7. Press the COLOR button on the 1020.
8. Type in the code for (See Table 3-1): 20 columns per line  
Enable International character set  
and press RETURN.
9. Press the COLOR button on the 1020. The print head should advance a step.
10. Type in the code for (See Table 3-1): 80 columns per line  
Disable International character set  
and press RETURN.

11. Press the COLOR button on the 1020. The print head should advance one step.
12. Type in the code for (See Table 3-1): 40 columns per line and press RETURN.
13. Using the sample printout as a model (See Figure 3-4), examine the characters to determine if they are the correct shape. If they are not the correct shape, proceed to the Diagnostic Flowchart, page 4-2.

If the printout is correct, check for the following problems:

- Is the print lighter on one side of the lines than the other? If so, replace either: 1) the pens  
2) the rotary pen holder.

### Specific Command Code Failures

If the customer complains of a specific code failure (Example: won't draw in graphics mode), verify the complaint, then check chips A1 and A2. Swap these out one by one using procedures on page 4-1.

Figure 3-4 is a black and white representation of the Operator Test printout.

```
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJ
KLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstu
vwxyz{|
```

```
áùñéçôòìíîïðëôóöûäåî
èèñêääâ↑↓←→ !"#$%&'(
)*+, -./0123456789:;<
=>?@ABCDEFGHIJ-KLMNOP
QRSTUVWXYZ[\]^_`abcde
fghijklmnopqrstuvwxyz
{|~<>
```

```
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJ
KLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstu
vwxyz{|
```

```
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJ
KLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstu
vwxyz{|
```

Figure 3-4. Operator Test Sample Printout

## SECTION 4

### DIAGNOSTIC FLOWCHARTS

#### OVERVIEW

The Diagnostic Flowchart is intended to be easy to use and the primary aid when troubleshooting the 1020. Follow the prompts in the order presented. When a question is asked, follow the line from the box that best applies to your unit's condition. When that line terminates with a letter inside a circle, locate the letter on a different page and continue the diagnosis. The flowchart leaves nothing to chance, it tells you when to perform a specific test and when to replace components. Refer to Section 6, Disassembly/Assembly for adjustments and replacements discussed in the flowcharts. Refer to Section 3 for Tests which are referenced in the flowcharts.

#### SWAPOUT PROCEDURE

At many places in the diagnostic flowchart, a box tells you to "swapout" a component, a chip, or a number of chips in a particular order. The "swapout" instruction means that you should replace the indicated components (one at a time) with a known-good component of the same type. The unit should then be tested with the new, known-good component in place to see whether the swapout solved the problem being checked. If the swapout did not fix the problem, leave in the new chip and swapout the next. Repeat this procedure for the rest of the swapout. Once the unit properly functions, reinstall the removed IC's to determine which are actually defective.

#### REPLACE IN ORDER

The "replace in order" instruction means that you should replace the components indicated in the order listed until the result called out in the previous block is obtained.

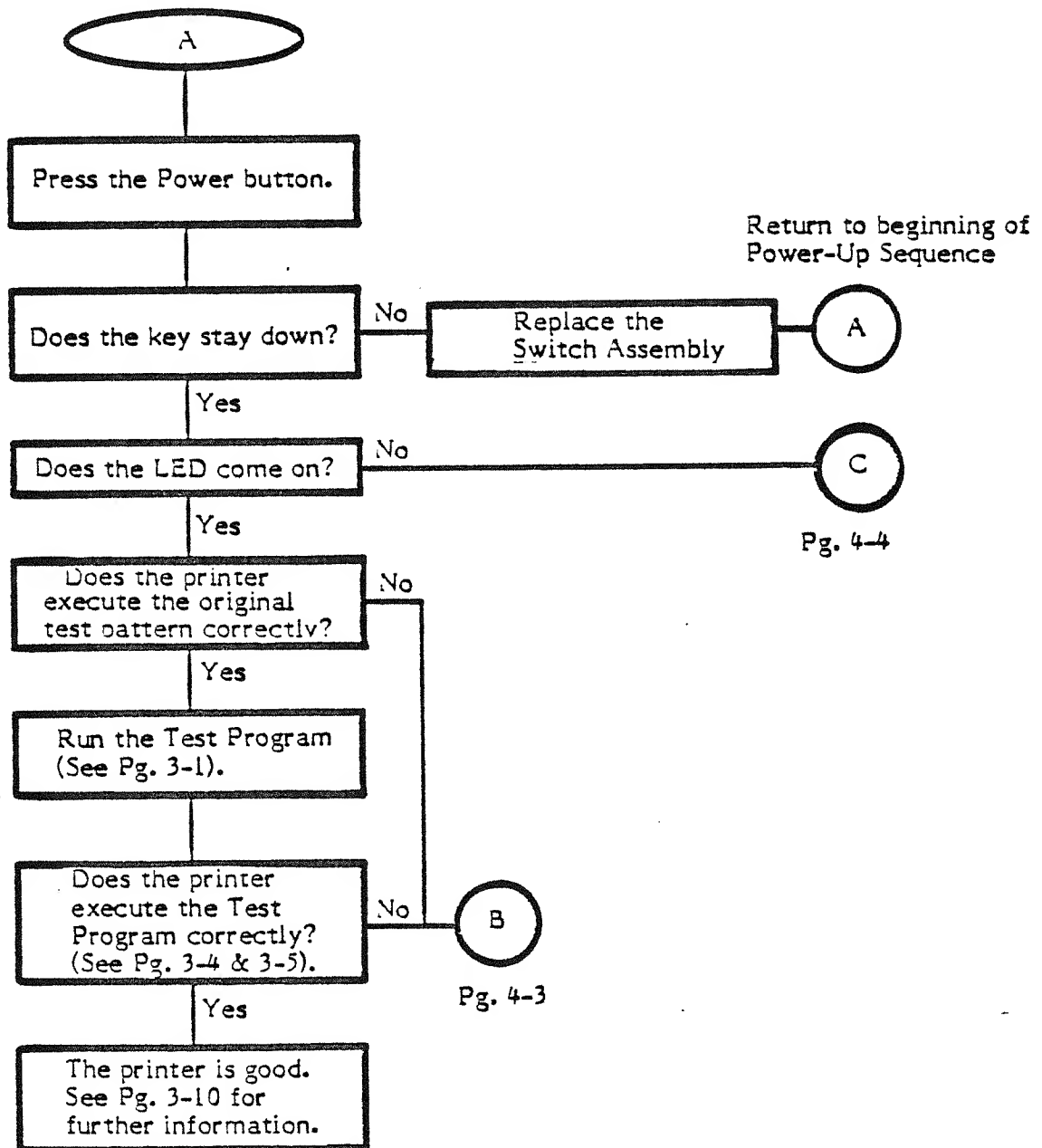
**A** - Some lines terminate with an **A** inside a circle. When this occurs return to the beginning of the Power-up sequence, Page 4-2.

If you need further clarification, call your Atari Repair Hotline.

Inside California  
(800) 672-1466

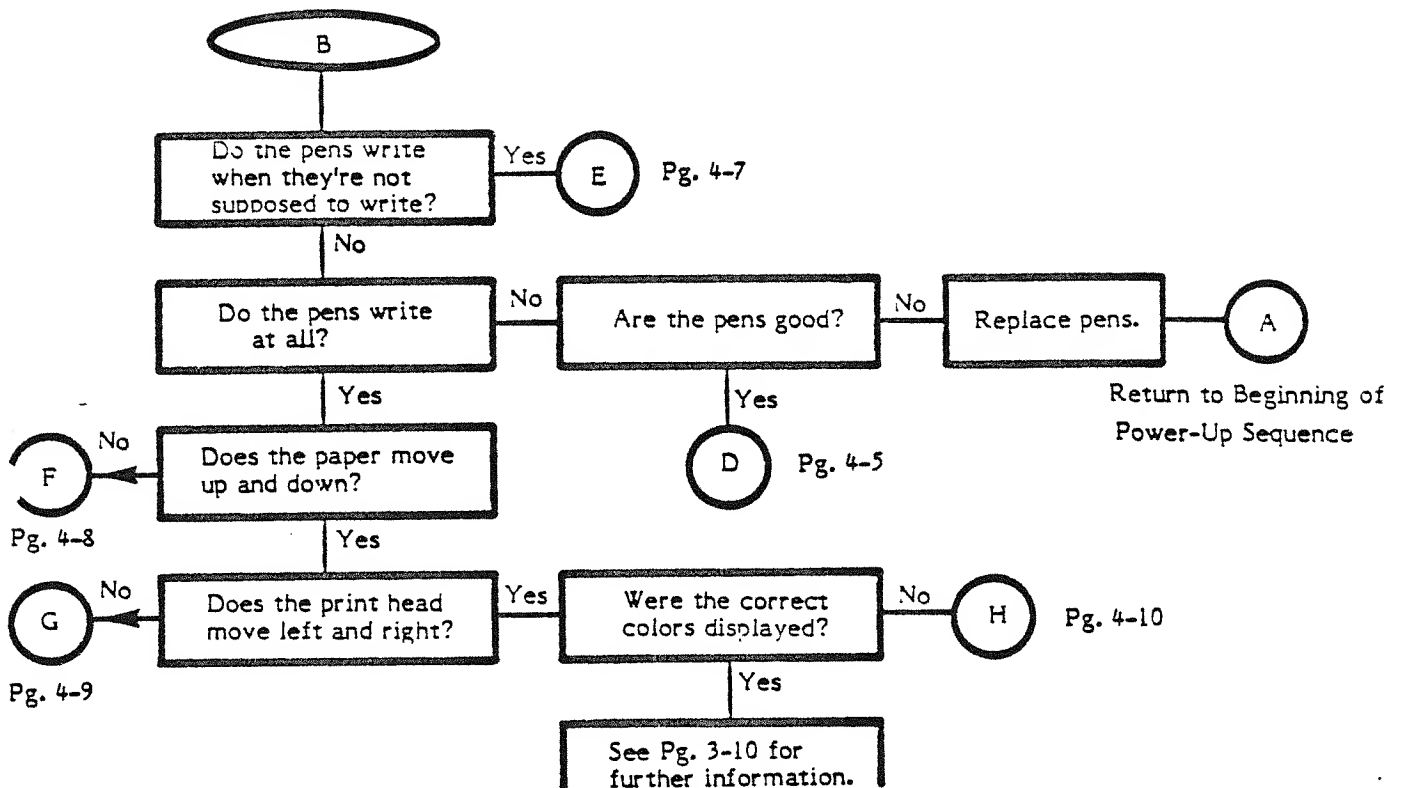
Outside California  
(800) 538-1535

## POWER-UP SEQUENCE

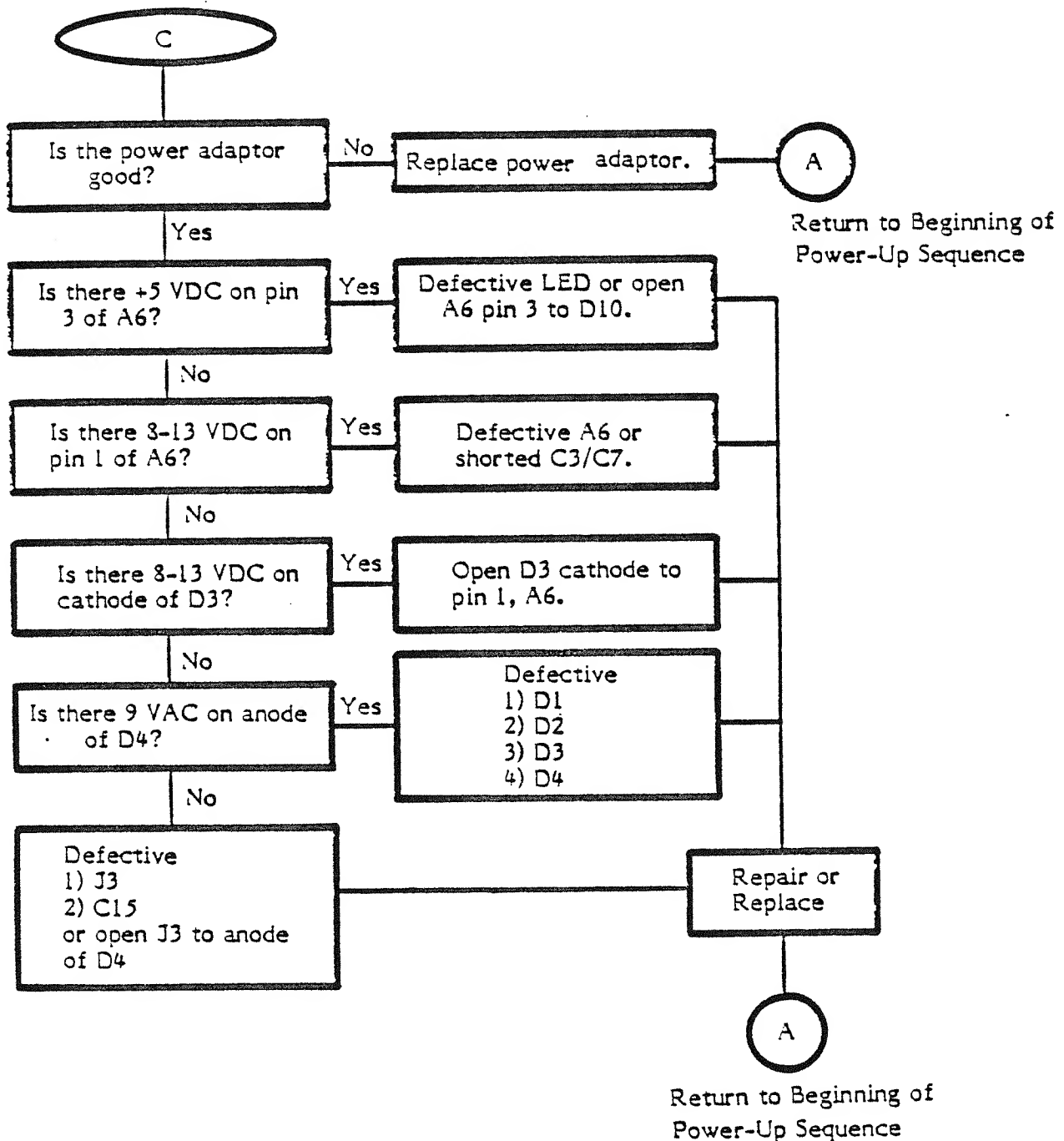




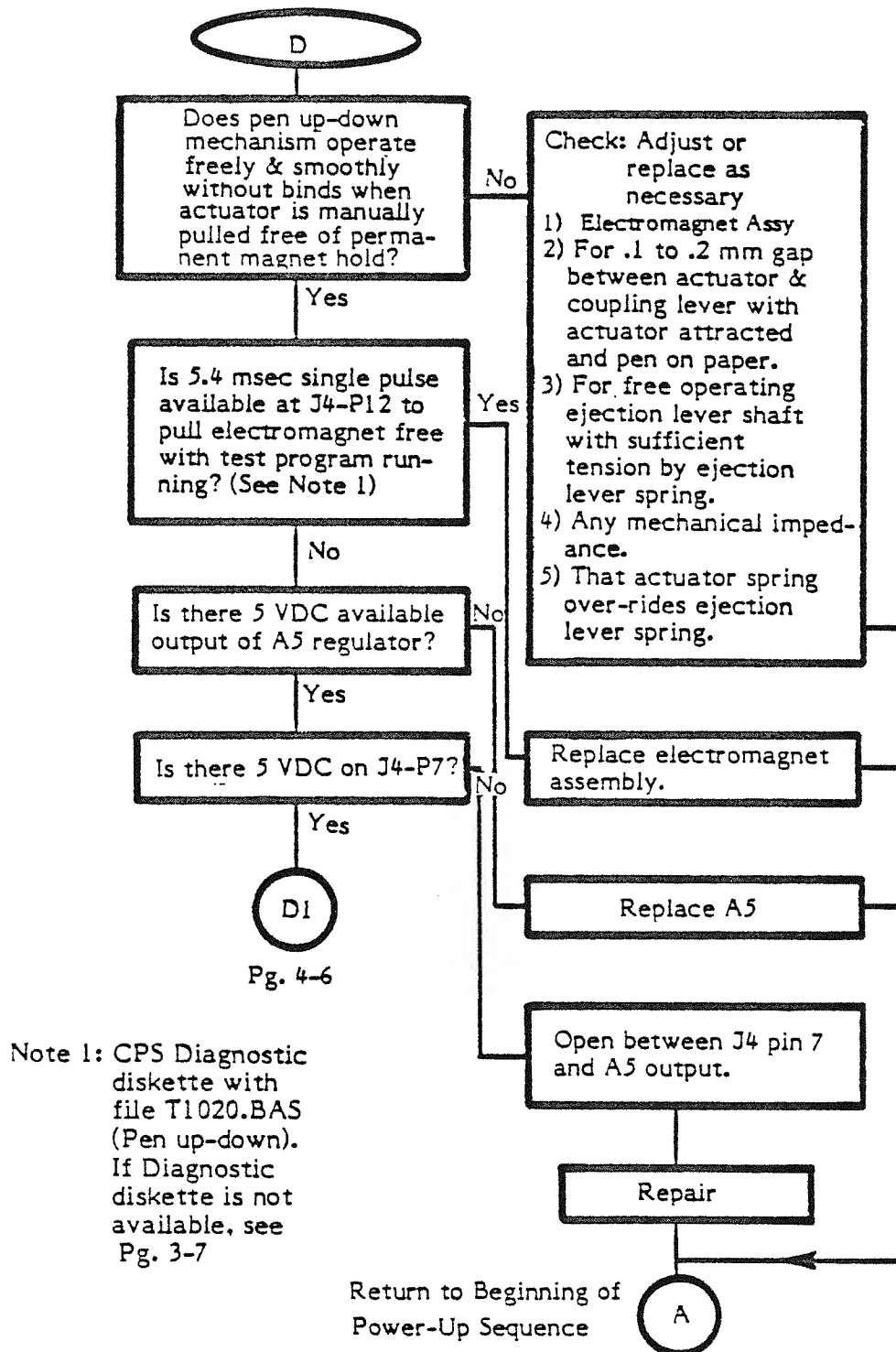
# POWER-UP SEQUENCE (cont.)



## NO POWER TROUBLESHOOTING



## PEN-DOWN TROUBLESHOOTING



## PEN-DOWN TROUBLESHOOTING (cont)

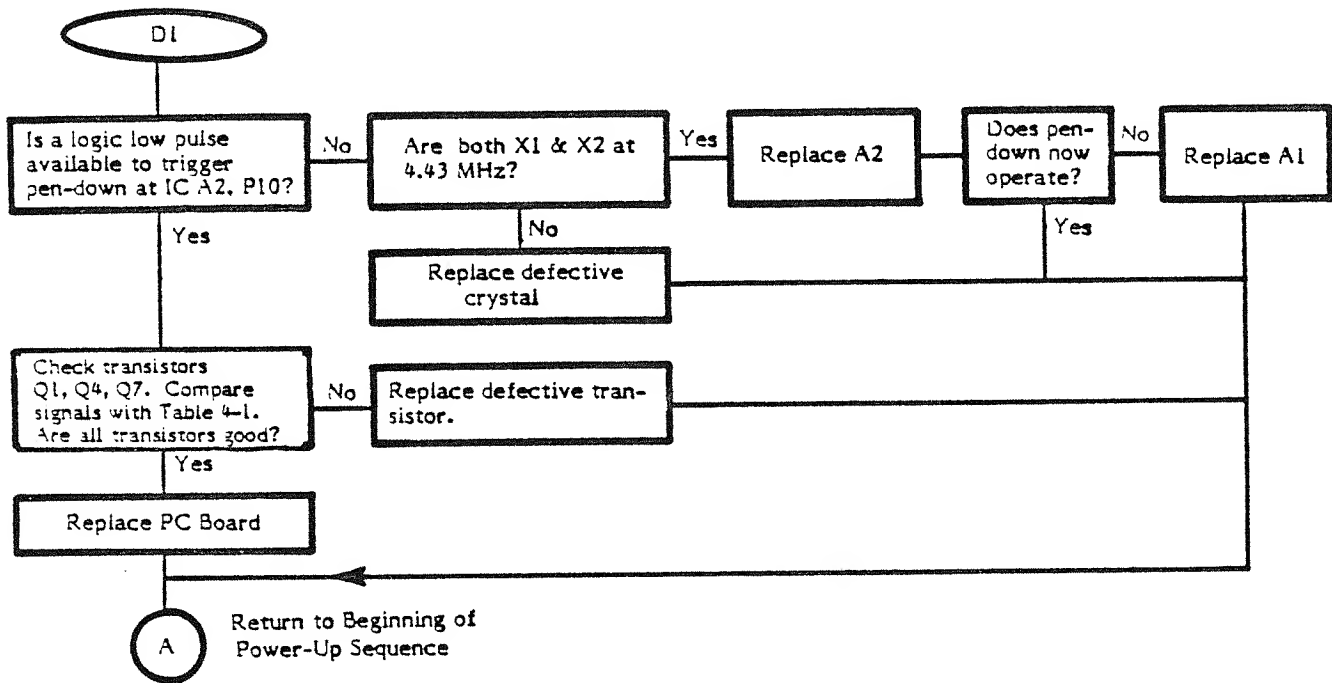
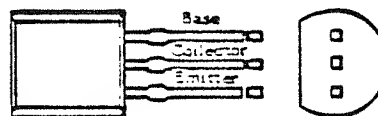


Table 4-1  
Pen Up-Down Transistor Check  
(All signals should be approx. 5 msec pulse while pen up-down test is running)

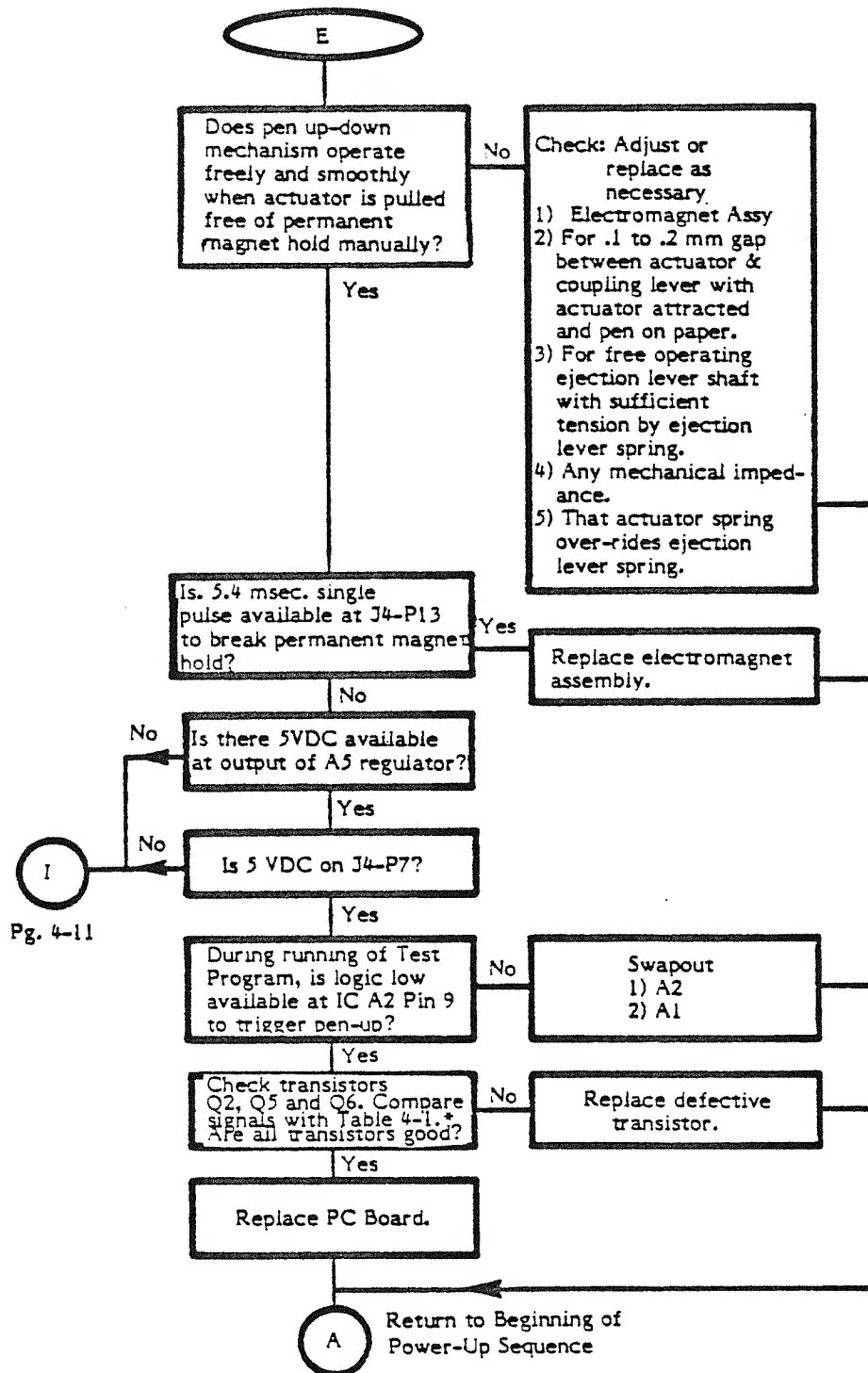
UP TRANSISTOR	DOWN TRANSISTOR	VOLTAGE from to	
A2 pin 9	A2 pin 10	5V	0V
Q2	Q1	connected to Vc 5V 4V 0V 5V	
E	E		
B	B		
C	C	connected to GND 0V 1V 5V 0V	
Q3	Q4		
E	E		
B	B	connected to Vp 5V 4V 5V 0V	
C	C		
Q6	Q7		
E	E		
B	B		
C	C		

Note that lead identification is as shown below.



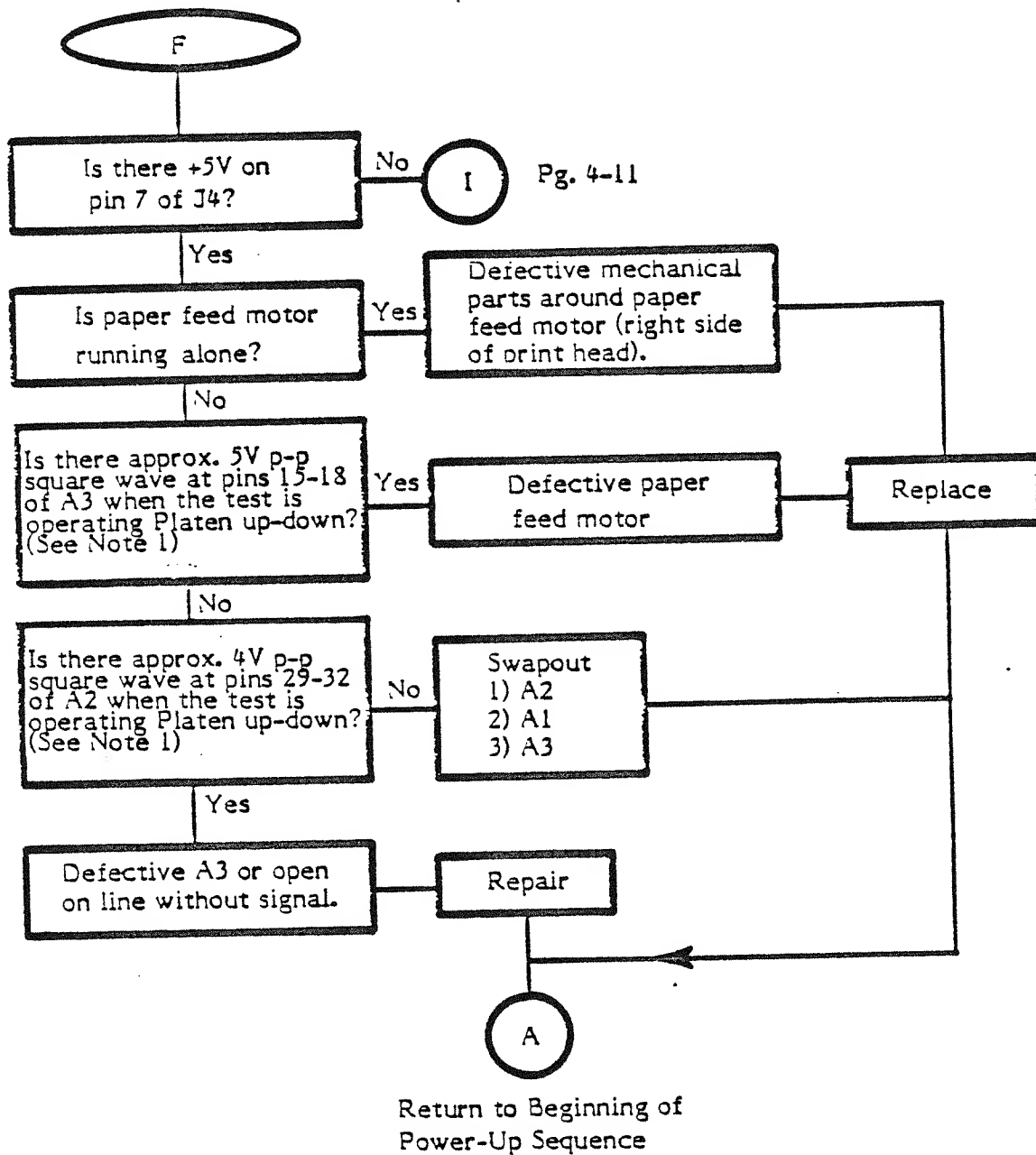
**NOTE:** Printer mechanism does not have to be connected to check for pulse.

## PEN-UP TROUBLESHOOTING



\*Page 4-6

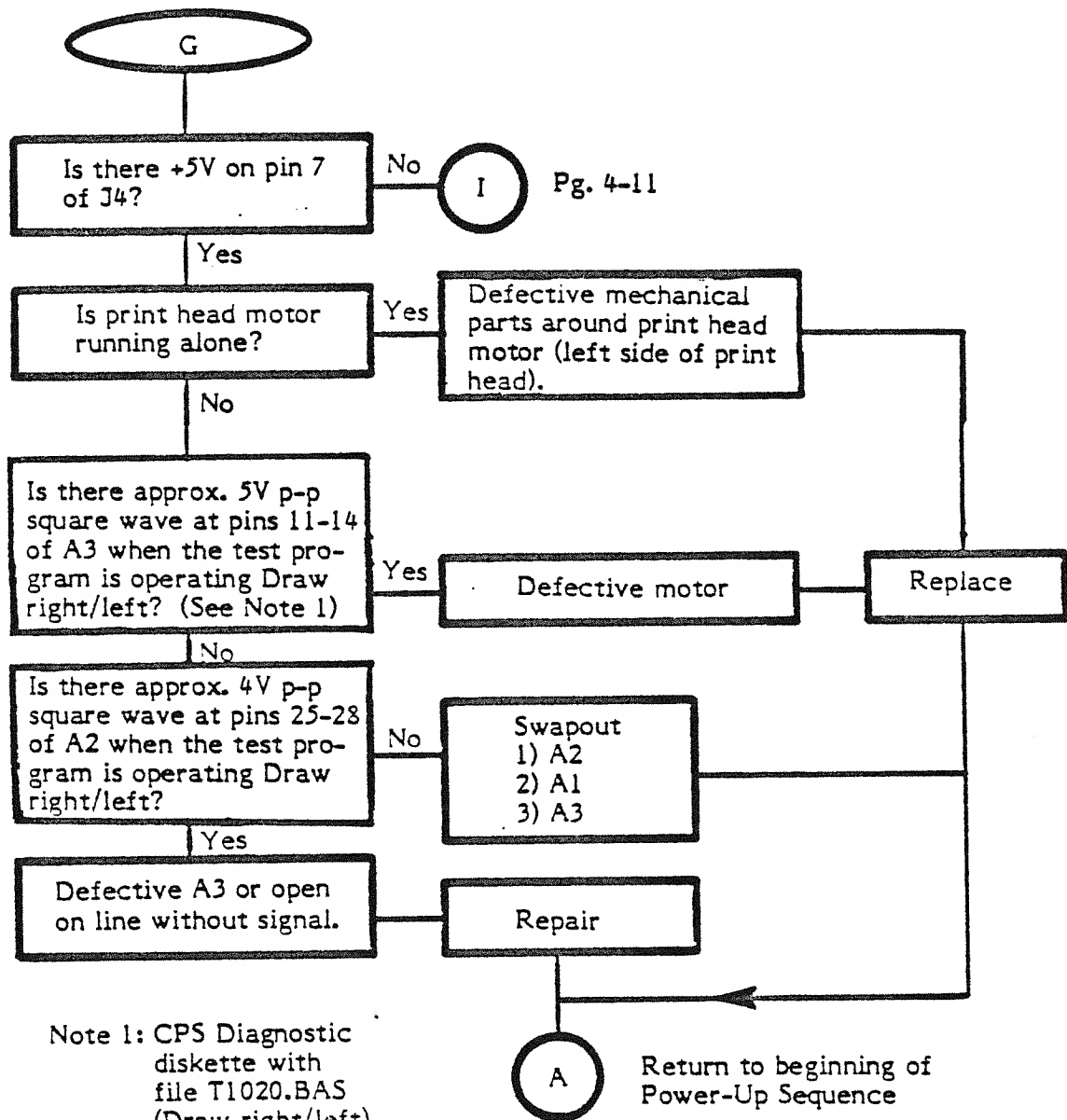
## NO PAPER FEED TROUBLESHOOTING



Note 1: CPS Diagnostic diskette with file T1020.BAS (Platen up-down). If Diagnostic diskette is not available, see Pg. 3-8

NOTE: Platen-up pulls paper in when paper is loaded. To avoid paper waste, execute Platen-down or remove paper when executing Platen-up.

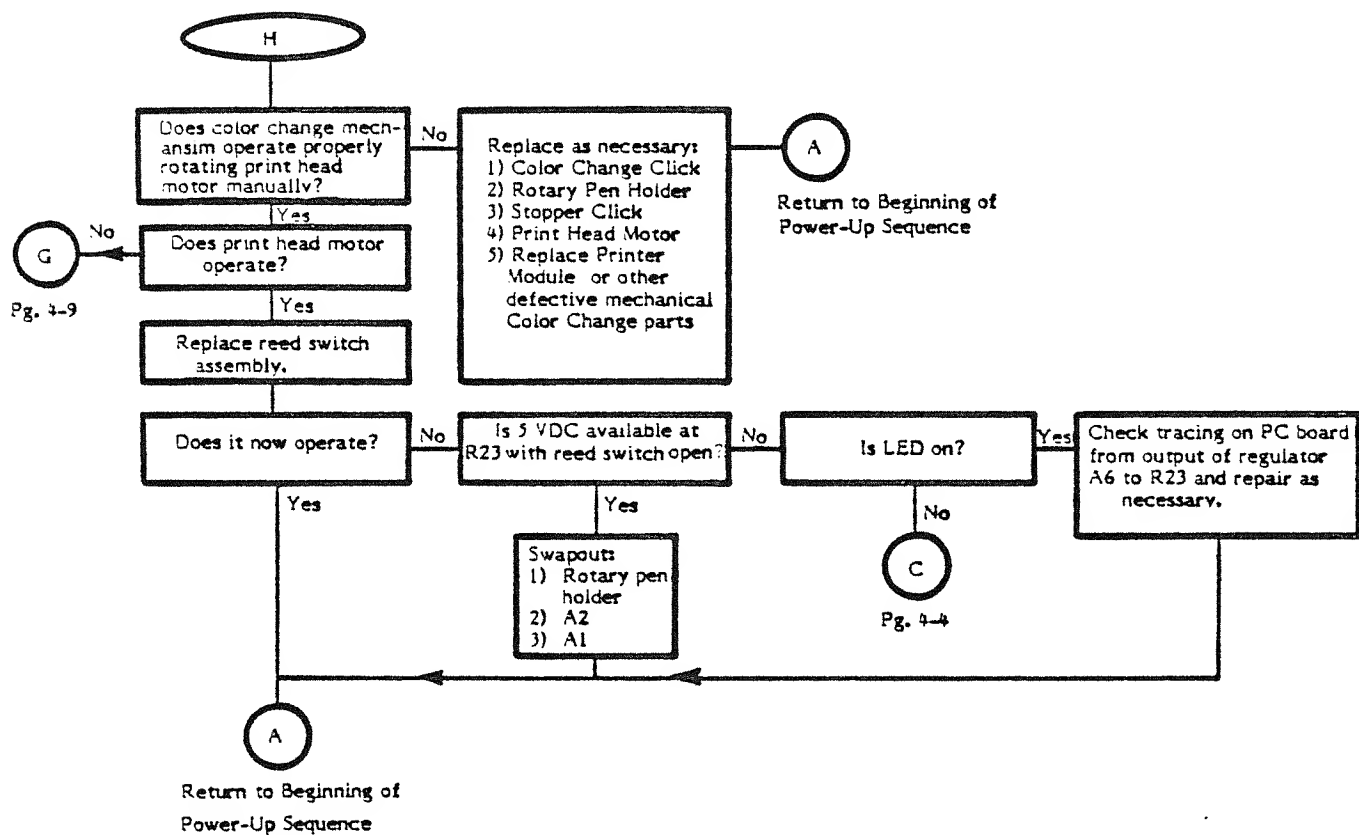
# PRINT HEAD DOES NOT MOVE



Note 1: CPS Diagnostic diskette with file T1020.BAS (Draw right/left). If Diagnostic diskette is not available, see Pg. 3-7

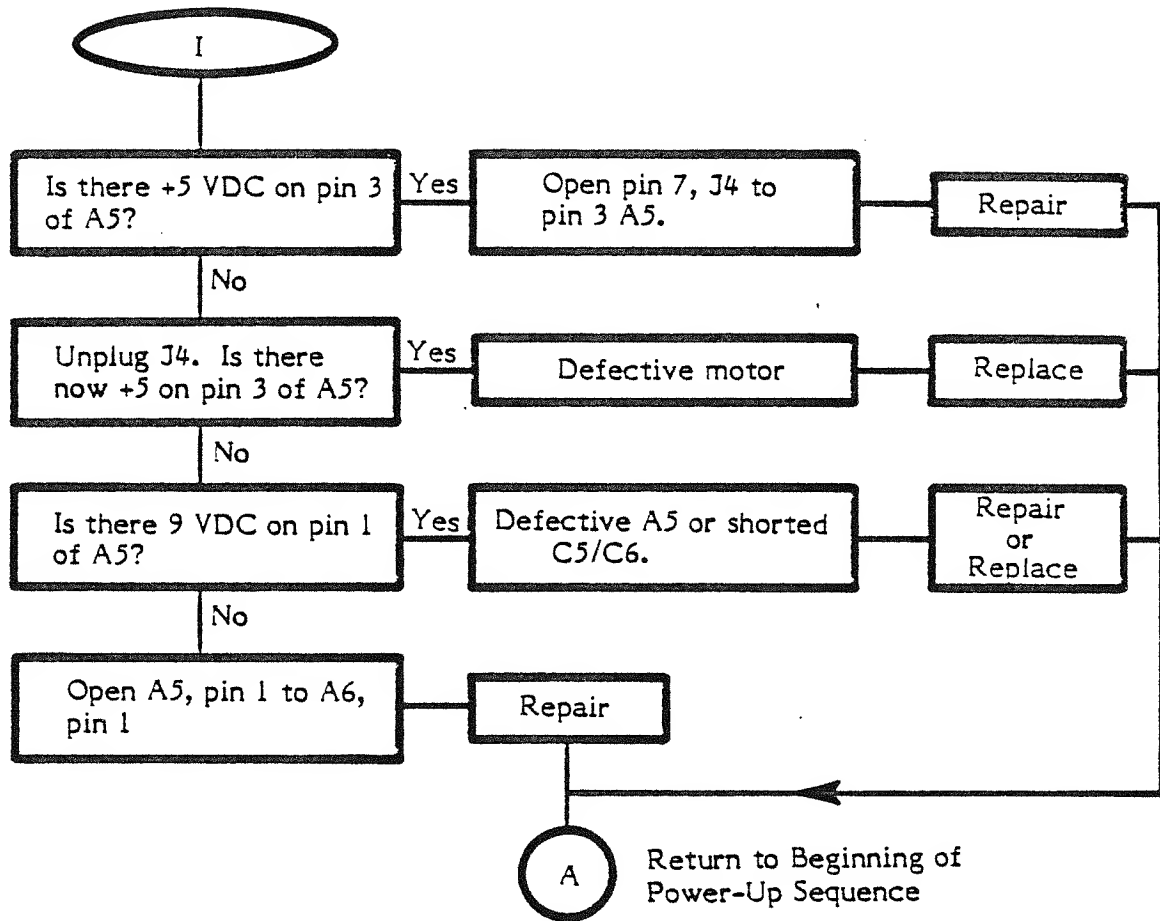
NOTE: Draw right/left moves the pen carriage right and left. The pen may not be down, therefore no line will be drawn.

## COLOR CHANGE TROUBLESHOOTING





# NO UP OUTPUT





## SECTION 5

### SYMPTOM CHECKLIST

<u>Symptom</u>	<u>Possible Cause</u>	<u>Flowchart Entry Point</u>
LED No Power	D10, A6, D1-D4, J3	C, Page 4-4
No Initialization	A1, A2, A3, Motors, Pens	B, Page 4-3
Pens Do Not Write	Pens, J4, Print Mech, A1, A2, A3	E, Page 4-7
Pens Always Write	J4, Print Mech, A1, A2, A3	D, Page 4-5
No Paper Feed	Print Mech, A1, A2, A3	F, Page 4-8
Print Head Does Not Move	Print Mech, J4, A1, A2, A3	G, Page 4-9



## SECTION 6

### DISASSEMBLY/ASSEMBLY

#### Equipment Required

- a precision screwdriver set
- a solder iron
- pliers
- tweezers
- a small can of light weight oil
- Snap Ring Tool (optional)
- a feeler gauge

#### Preventive Maintenance

Each Atari 1020 Color Printer which is disassembled must have the following Preventive Maintenance performed:

- Carefully clean any dust or dirt from inside the unit - use a dry, soft cloth.
- Use alcohol or benzene to remove any stains. Do not use thinner, trichloroethylene or ketone solvents — they may damage the plastic parts.
- Lubricate each of the following points with one small drop of light weight oil: Use Figure 6-1 as reference for these points.
  - the pivot point of the ejector shaft (left front of printer module)
  - the ejection roller (move the slider unit back and forth a few times to distribute the oil evenly along the shaft)

#### Adjustments

Before returning the unit to the customer be certain that the following adjustments are correct.

- Actuator and Coupling Lever Adjustment (See Page 6-5)
- Pen and Paper Platen Adjustment (See Page 6-6)

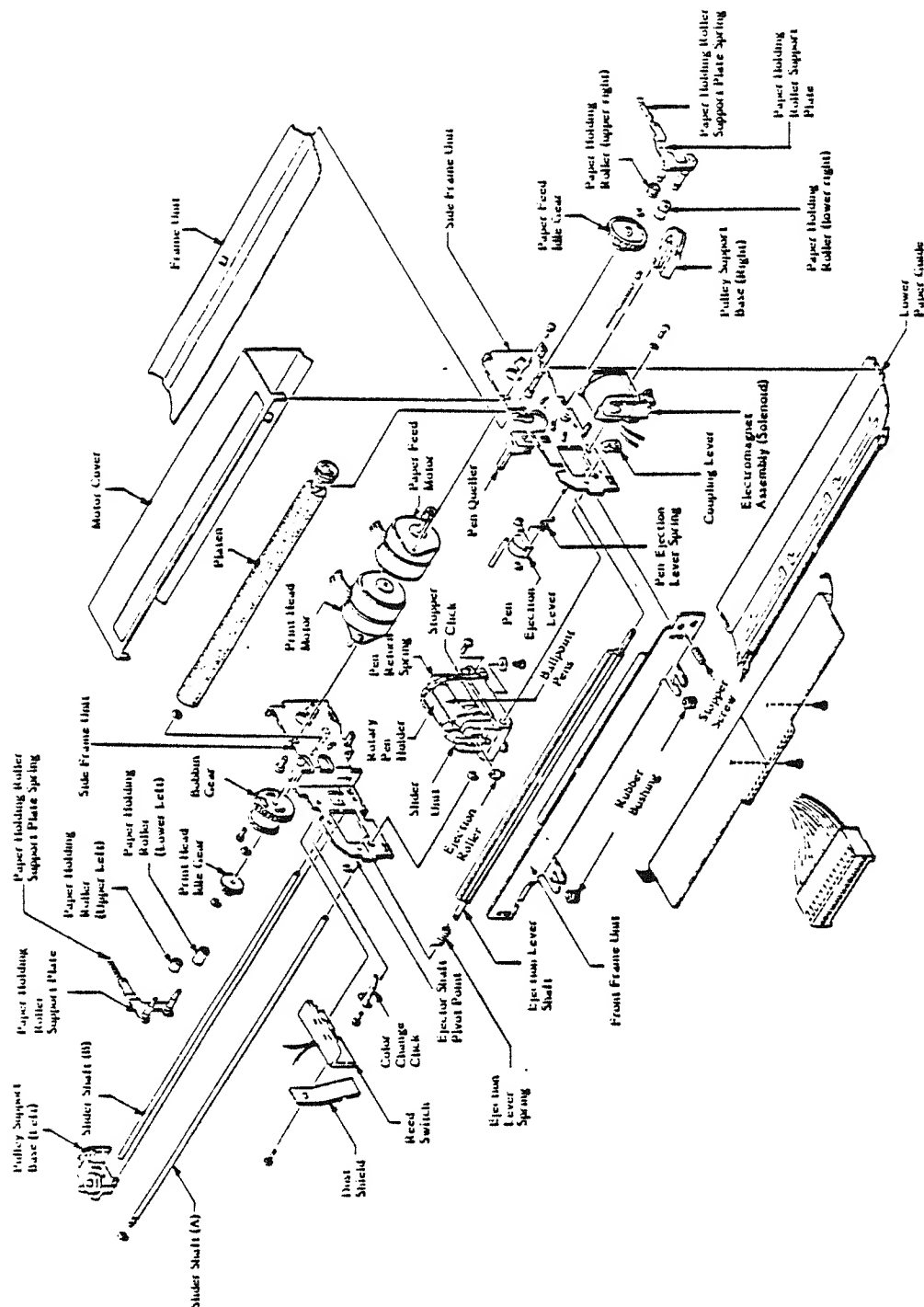


Figure 6-1. 1020 Color Printer Mechanical Assembly

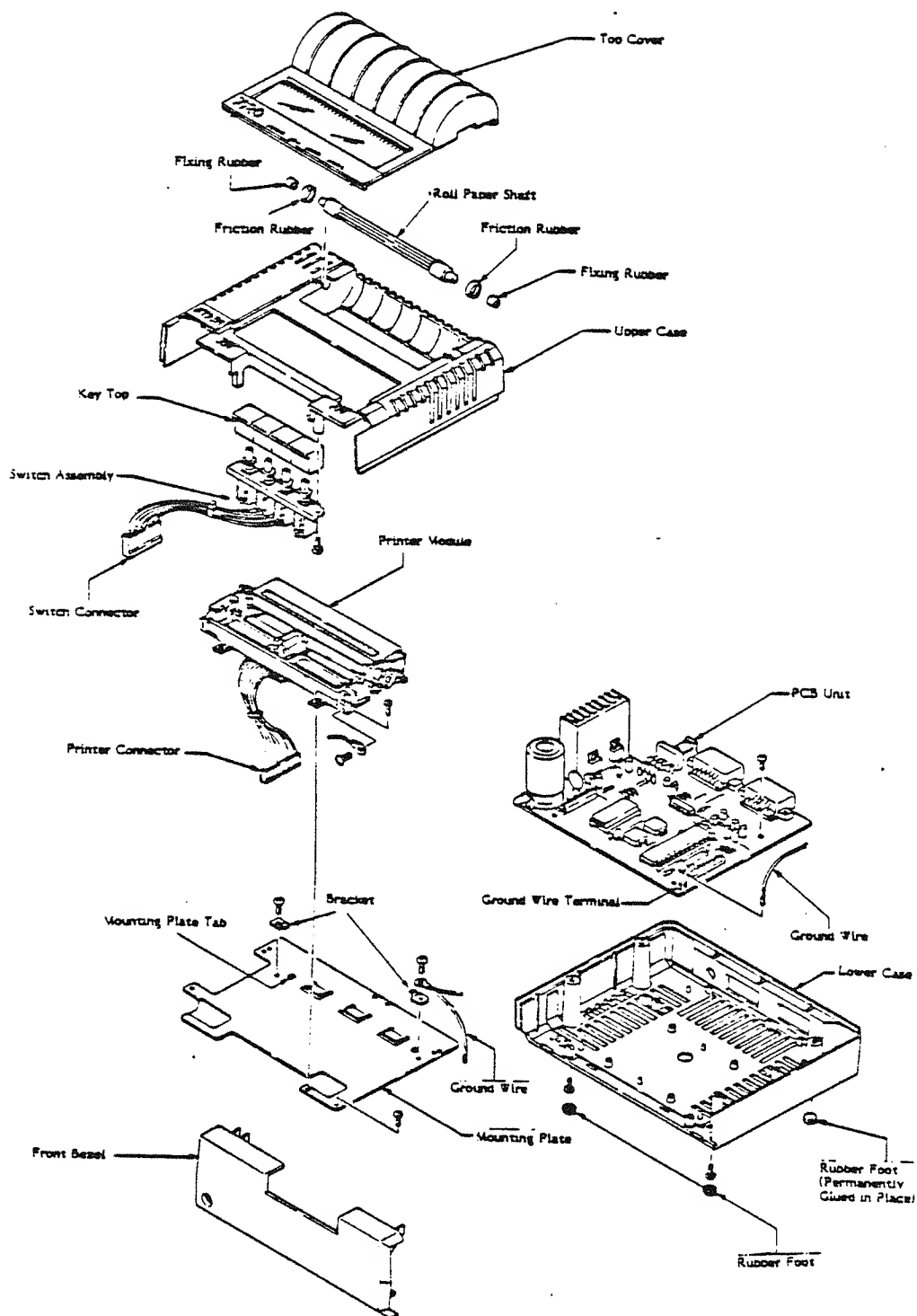


Figure 6-2. 1020 Color Printer Final Assembly.

## DISASSEMBLY

**WARNING:** Be sure unit is unplugged from AC power before disassembly to any level.

Use Figure 6-1 and Figure 6-2 as reference for 1020 Color Printer Disassembly/Assembly.

### Case Disassembly/Switch Assembly Removal

- Slide the top cover back to disengage the tabs from the bezel. Lift off the top cover and remove the paper roll.
- Turn the printer upside down and remove the two front rubber feet (back rubber feet are permanently glued in place).
- Remove the two machine screws under the feet.
- Remove the three wave screws.
- Turn the unit right side up. Disconnect the upper case from the lower case by slightly lifting the back portion of the upper case.
- Pull the lower front portion of the bezel forward and disengage the hooks on the upper side of the bezel from the upper case.
- Set the bezel aside.
- Set the upper case upside down in front of the lower case.
- Remove the two screws which hold the switch assembly in place.
- Remove the upper case.
- To access the switch assembly harness, loosen the mounting plate screw (right front) and swing the plate aside.

### Printer Module Removal

- Remove the screw (right front) which holds the mounting plate to the lower case. Lift the mounting plate with printer module attached.
- Remove the ground wire from the PC board (right front).
- To remove the printer module from the mounting plate:
  - remove the two front screws which hold the printer module to the mounting plate.
  - Loosen, but do not remove the two rear screws and brackets. Loosen them enough to slide the rubber pads on the printer module out from under the brackets.



The following pages contain instructions for printer module component removal and replacement. These include:

- the Electromagnet Assembly (Solenoid)
- the Reed Switch
- the Color Change Click
- the Motor Cover, Print Head Motor and Paper Feed Motor
- the Rotary Pen Holder
- the Stopper Click
- the Paper Feed Idle Gear
- the Ejection Lever Spring
- the Paper Holding Rollers
- the Print Head Idle Gear

#### Electromagnet Assembly (Solenoid) Removal and Replacement

**NOTE:** Do not use magnetic substance near the electromagnet assembly.

- Remove the Phillips-head screw which holds the electromagnet assembly to the printer module frame (right front, under electromagnet assembly).
- Desolder the two electromagnet assembly wires from the PC Board. Note where each is attached - you will need to recheck this during re-assembly.

To replace the electromagnet assembly:

- Insert the holding pin on the electromagnet assembly into the frame unit.
- Insert, but do not yet tighten the Phillips-head screw which holds the electromagnet assembly to the frame. You will tighten it when you make the actuator/coupling lever adjustment.

**NOTE:** The following adjustments must be made when the electromagnet assembly is replaced.

#### Actuator and Coupling Lever Adjustment

- Place a pen in the rotary pen holder and pull the actuator of the electromagnet assembly out to make the pen down condition.
- Adjust the gap between the actuator and coupling lever to 0.1-0.2 mm (See Figure 6-3).
- Tighten the screw which holds the electromagnetic assembly to the frame unit.

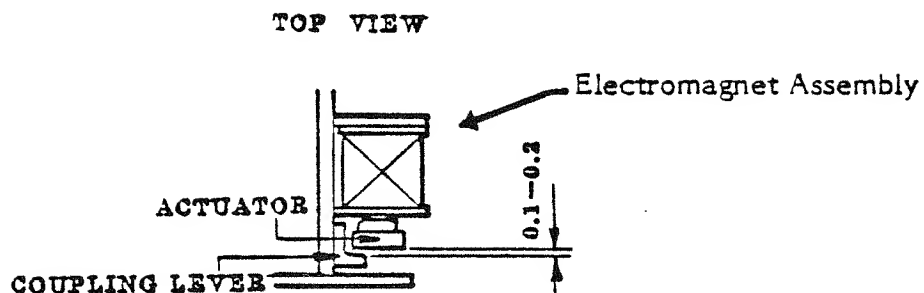


Figure 6-3. Actuator/Coupling Lever Adjustment

#### Pen and Paper Platen Adjustment

- Pull the actuator to make the pen up condition.
- Adjust the gap between the ball-point pen and paper platen by turning the stopper screw (see Figure 6-4). The gap should be within the range of 0.6-0.7 mm. (For reference: turning the screw counter-clockwise widens the gap.)
- Solder the two electromagnet assembly wires (one black; one red) to the PC board. Be sure that each wire is attached to the correct point on the PC board.

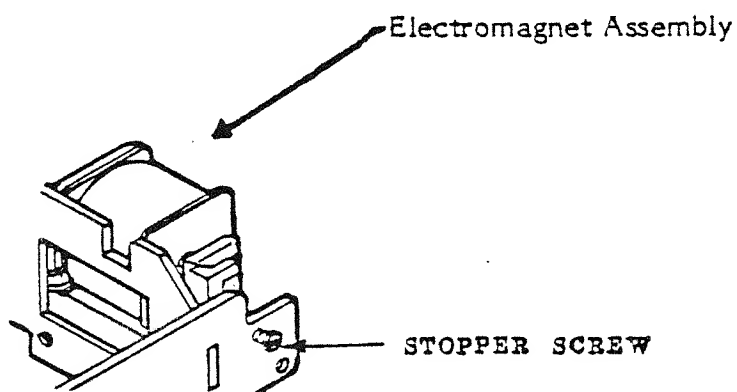


Figure 6-4. Pen and Paper Platen Adjustment

### Reed Switch Removal and Replacement

- Remove the Phillips-head screw and dust shield.
- Desolder the two wires (one yellow; one grey) from the PC board.

To replace the Reed Switch:

- Align the hole in the Reed Switch over the holding pin on the frame unit.
- Insert and tighten the Phillips-head screw which holds the switch to the frame unit.
- Solder the two wires (one yellow; one grey) on the PC board.

### Color Change Click Removal and Replacement

Before starting to disassemble, note the threading of the wiring harness. You will need to recheck that it is threaded correctly during reassembly. **CAUTION:** Be sure that the wiring harness is not rubbing on the cable or pinched underneath the printer mechanism.

- Carefully insert a flat blade screwdriver between the frame unit and the Pulley Support Base (Left) unit. Exert pressure to push the Pulley Support Base unit away from the frame unit and slide the mounting tab out of the frame unit hole.

**Be sure that the wire does not unwind from the pulley.**

- Carefully slide the Pulley Support Base unit to the left and back to expose the screw holding the Color Change Click to the frame.
- Loosen the screw and remove the color change click. Be careful, the slider shaft (B) can slide out easily at this point.

To replace the Color Change Click:

- Align the hole in the Color Change Click over the holding pin in the frame unit.
- Insert and tighten the Phillips-head screw which holds the Color Change Click to the frame.
- Reposition the Pulley Support Base over the screw on the outside of the frame. Align the base with the frame unit (mounting tab over the hole in frame; pulley in frame unit opening). Move the bobbin gear to get more slack if the wire is too tight.
- Gently push (with needle nose pliers, if necessary) the Pulley Support Base into position. Be sure that the horizontal and vertical planes are level.
- Check that the slider shaft (B) cannot slide out of the holes in the frame unit.

- Check that the wiring harness is threaded correctly (not rubbing against the wire or pinched under printer module).

#### Motor Cover, Print Head Motor and Paper Feed Motor Removal and Replacement

- Insert a flat blade screwdriver between the motor cover and frame unit (see Figure 6-5). Gently push the cover up and slightly forward to remove it.

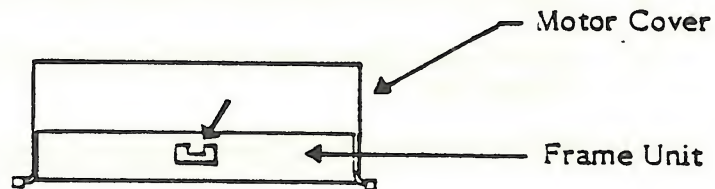


Figure 6-5. Motor Cover Removal

Be sure to note the threading of the motor wiring harness. You will need to recheck that it is threaded correctly during reassembly. Be sure that the motor wiring harness is not rubbing on the cable or pinched underneath the printer mechanism.

NOTE: Removal procedure is identical for either motor (first five steps below). Step six below identifies the wires to de-solder for each motor.

- To access the screw holding the motor to the frame, disconnect the spring attached to the Paper Holding Roller Support Plate from the frame. Remove the Phillips-head screw which holds the motor to the frame.
- Insert a flat blade screwdriver under the motor, between the frame unit and motor. Gently pry with enough pressure to disengage the motor. Be careful not to bend the frame unit.
- Desolder the jumper wire between the PC board attached to each motor.
- Remove the screw which attaches the PC board to the frame unit.
- Unthread the wiring harness from the frame unit and remove the motor.
- If you are removing the Print Head motor, desolder the two reed switch wires (one yellow; one grey) from the PCB. Note where each is attached - you will need to re-check this during re-assembly.

If you are removing the Paper Feed motor, desolder the two electromagnet assembly wires (one black; one red) from the PCB. Note where each is attached - you will need to recheck this during re-assembly.

To replace the Print Head and the Paper Feed Motors and the Motor Cover:

- Insert the gear and the motor shaft through the hole in the frame unit (behind the Roller Support Plate Spring).
- Rotate the motor body so that the flange is even with the hole in the frame unit.



- Align the motor bushing with the hole in the frame unit.
- Check that the gears are engaged correctly.
- Insert and tighten the screw which holds the motor to the frame.
- Reconnect the spring from the Paper Holding Roller Support Plate to the frame unit.
- Insert and tighten the screw which holds the PC board to the frame unit.
- Solder the jumper wire in place between the Print Head motor PC board and the Paper Feed motor PC board.
- If you are replacing the Print Head motor, solder the two wires (one yellow; one grey) connected to the Reed Switch.  
  
If you are replacing the Paper Feed motor, solder the two wires (one red; one black) connected to the electromagnet unit.
- Check that the motor wiring harness is threaded correctly.
- Replace the motor cover. Tab at right front of cover fits over side frame, in front of screw which holds Paper Feed Motor. Then back of cover slides inside frame unit (Refer to Figure 6-5).

#### Rotary Pen Holder Removal and Replacement

- **Be sure the rotary pen holder is empty when you remove it.**
- Push the rotary pen holder slightly toward the platen to remove it. Lift the pen holder out (front end first). Be sure the pen holder is empty when you remove it.

To replace the Rotary Pen Holder

- Insert the tip of the rotary pen holder through the hole in the pen-return spring on the slider unit.
- Push the rotary pen holder slightly toward the platen. This allows the hole in the front (opposite platen) portion of the holder to fit over the tab in the slider unit.

#### Stopper Click Removal and Replacement

- Slide the rotary pen holder to carriage left.
- Remove the Phillips-head screw which holds the stopper click to the slider unit.

To replace the Stopper Click:

- Slide the rotary pen holder to carriage left.

- Align the hole in the stopper click with the holding tab on the slider unit.
- Insert and tighten the screw which holds the stopper click to the slider unit.

#### Paper Feed Idle Gear Removal and Replacement

- Remove the 1.5 E-ring from the idle gear.
- Slide the idle gear off the shaft.

To replace the idle gear:

- Slide the new gear onto shaft. Be sure that teeth mesh properly with adjacent gears.
- Clamp the 1.5 E-ring in place over the end of the shaft.

#### Ejection Lever Spring Removal and Replacement

- Move the slider unit to the center of the carriage.
- Remove the Phillips-head screw which holds the electromagnet assembly to the printer module frame (right front, under electromagnet assembly).
- Be sure to note how one leg of the spring fits over the frame and the other leg fits over the ejection lever shaft.
- Remove the 1.5 E-ring from the end of the ejection lever shaft.
- Slide the shaft to the right to allow access to the spring.
- Remove and replace the spring. Be sure that the legs of the new spring are placed properly over the frame and the ejection lever shaft.
- Place the ejection lever shaft through the hole in the left frame and replace the 1.5 E-ring.
- Replace the electromagnet assembly (See Page 6-5).

**CAUTION: BE SURE TO MAKE THE FOLLOWING ADJUSTMENTS WHEN REPLACING THE ELECTROMAGNET ASSEMBLY:**

- ACTUATOR AND COUPLING LEVER ADJUSTMENT (SEE PAGE 6-5).
- PEN AND PAPER PLATEN ADJUSTMENT (SEE PAGE 6-6).

#### Paper Holding Roller (Upper) Removal and Replacement

- Move the slider unit away from the side where you are working.

Note that the right paper holding roller has a groove in it and the left roller is smooth.

**CAUTION: BE CAREFUL NOT TO DAMAGE THE WIRE OR GEARS  
WHEN REPLACING THE ROLLERS.**

- Disconnect the spring attached to the paper holding roller support plate from the frame. This allows easier access to the rollers.
- Remove and replace the roller.
- Reconnect the spring from the paper holding roller support plate to the frame.

Print Head Idle Gear Removal and Replacement

You will need to move the Bobbin gear aside in order to access the gear near the print head motor. Do not remove the Bobbin gear. Be careful not to cross or unwind the Bobbin gear wire.

- Remove the 1.5 E-ring from the Bobbin gear.
- Move the Bobbin gear far enough out of the way to allow access to the Print Head Idle gear.
- Remove the 1.5 E-ring from the gear.
- Slide the gear off the shaft.

To replace the Print Head Idle Gear:

- Slide the new gear onto the shaft. Be sure that the teeth mesh properly with adjacent gears.
- Clamp the 1.5 E-ring in place over the end of the shaft.
- Place the Bobbin gear over the shaft. Be sure the gear meshes correctly with adjacent gears.
- Clamp the 1.5 E-ring over the shaft.

PC Board Removal

- Remove the four screws which hold the PC board to the lower case.
- Disconnect the Ground wire from the PC board.
- Disconnect the switch assembly wiring harness.

## ASSEMBLY

### PC Board Replacement

- Align the four screw holes on the PC board with the holes in the lower case. Check that the power jack and the I/O connectors are properly aligned with the cut-outs in the lower case back.
- Insert and tighten the four screws.
- Replace the switch assembly wiring harness (J5).

### Printer Module Replacement

To replace the printer module on the mounting plate:

- Slide the rubber pads on the printer module against the two tabs on the mounting plate. Place the brackets over the rubber pads and tighten the Phillips-head screws.
- Insert and tighten the two front screws which hold the printer module to the mounting plate.
- Connect the wiring harness to the PC board (J4).
- Align the mounting plate holes with the support post holes (the rear posts have holding tabs).
- Insert and tighten the screw which holds the Ground wire in place (right front support post).
- Connect the Ground wire to the Ground wire terminal on the PC board.

### Switch Assembly Replacement/Case Assembly

- Place the upper case upside down on the table (front of case toward front of unit).
- Position the switch assembly upside down over the two screw holes at the front of the upper case. (Key extensions should be toward the front of the case.)
- Insert and tighten the two screws which hold the switch assembly to the upper case.
- Fit the upper case over the lower case.
- Slide the bezel tabs under the upper case and lock in place by pushing the bottom of bezel against the lower case.
- Turn the unit upside down.
- Insert and tighten the three wave screws.



- Insert and tighten the two machine screws.
- Insert the two front rubber feet over the machine screws.
- Turn the unit right side up and replace the paper roll.
- Insert the top cover (insert back first):
  - Fit the top cover tabs into the upper case (holes at back).
  - Slide the front tabs into place.



## SECTION 7

### PARTS LIST

<u>ITEM</u>	<u>LOCATION</u>	<u>DESCRIPTION</u>	<u>PART NO.</u>
1	PCB Unit	Printed Circuit Board, Loaded, Atari Spec	CA060459
2	A1	6805P ROM Version	FC100346
3	IS1	IC Socket (28P)	C014386-08
4	A2	6805V ROM Version	FC100347
5	IS2	IC Socket (40P)	C014386-09
6	A3	LB1257 Octal Power Driver	FC100348
7	A4	Two Input AND gate O.C HD74LS09	FC100632
8	A5, A6	Voltage Regulator +5V HA17805P	FC100350
9	Q1,2,3	PNP Transistor 2SA844(C) or (D)	FC100351
10	Q4,5	NPN Transistor 2SD788(C) or (D)	FC100352
11	Q6,7	PNP Transistor 2SB739(C) or (D)	FC100353
12	Q8,9	NPN Transistor 2SC945 Q, P or K	FC100354
13	D1,2,3,4	Diode, Rectifier V03C 1.3A	FC100355
14	D5,6,8,9	Diode, Signal 1S2076FA 250MW	FC100356
15	D7	Diode, Zener HZ11AFAVZ=9.9V	FC100358
16	D10	LED SLP-136C-50	C014776
17	X1,2	Crystal PX-1 4 MHz	FC100357
18	S1	Switch Module SUF-43	FC100359
19		Connector, Switch	FC100360
20		Connector, Printer	FC100361
21		Ballpoint Pen (std. Pack)	C061420-01
22		Roll Paper (Atari Spec)	C061533
23		Roll Paper Shaft	FC100365
24		Bezel Unit	FC100366
25		Cover Unit	FC100367
26		Rubber Foot (Front)	FC100369
27	Printer Unit	Mechanical Module	FC100385
28		Print Head Motor Unit (Carriage)	FC100370
29		Paper Feed Motor Unit (Platen)	FC100371
30		Paper Feed Idle Gear	FC100372
31		Paper Holding Roller (Upper Left)	FC100373
32		Paper Holding Roller (Upper Right)	FC100374
33		Electromagnet Assy (Solenoid)	FC100375
34		Rotary Pen Holder Set	FC100376
35		Stopper Click	FC100377
36		Reed Switch Unit	FC100378
37		Color Change Click	FC100379
38		Ejection Lever Spring	FC100380
39		Type E Stopper Ring 1.5	FC100381
40		Type E Stopper Ring 2.0	FC100382
41		Type E Stopper Ring 1.2	FC100383



## SECTION 8

### SERVICE BULLETINS

This section is to be used by you to file the three classifications of service bulletins that are periodically released by the Director of Technical Support.

The following are brief descriptions of each classification:

#### FIELD CHANGE ORDER

A Field Change Order describes mandatory hardware or software changes to ATARI products and instructs how to implement these changes. The changes must be performed on all units serviced or repaired.

#### UPGRADE BULLETIN

An Upgrade Bulletin describes product improvements or modifications that the consumer may wish to purchase. These bulletins allow you to modify the customer's unit to add capabilities which may not have been available when the unit was originally manufactured.

#### TECH TIP

A Tech Tip is a document of a general nature which transmits routine service or repair information. By communicating methods developed since you attended training classes, Tech Tips aid to continuously improve repair skills and increase knowledge of ATARI products.

Other times, Tech Tips alert you to units that have been modified and are now standard for ATARI Manufacturing, but are different from many existing units and require different repair techniques.

100

101

102

103

104

105

106

107

108

109

110

111

112

113

114

115

116

117

118

119

120

121

122

123

124

125

126

127

128

129

130

131

132

133

134

135

136

137

138

139

140

141

142

143

144

145

146

147

148

149

150

151

152

153

154

155

156

157

158

159

160

161

162

163

164

165

166

167

168

169

170

171

172

173

174

175

176

177

178

179

180

181

182

183

184

185

186

187

188

189

190

191

192

193

194

195

196

197

198

199

200

201

202

203

204

205

206

207

208

209

210

211

212

213

214

215

216

217

218

219

220

221

222

223

224

225

226

227

228

229

230

231

232

233

234

235

236

237

238

239

240

241

242

243

244

245

246

247

248

249

250

251

252

253

254

255

256

257

258

259

260

261

262

263

264

265

266

267

268

269

270

271

272

273

274

275

276

277

278

279

280

281

282

283

284

285

286

287

288

289

290

291

292

293

294

295

296

297

298

299

300

301

302

303

304

305

306

307

308

309

310

311

312

313

314

315

316

317

318

319

320

321

322

323

324

325

326

327

328

329

330

331

332

333

334

335

336

337

338

339

340

341

342

343

344

345

346

347

348

349

350

351

352

353

354

355

356

357

358

359

360

361

362

363

364

365

366

367

368

369

370

371

372

373

374

375

376

377

378

379

380

381

382

383

384

385

386

387

388

389

390

391

392

393

394

395

396

397

398

399

400

401

402

403

404

405

406

407

408

409

410

411

412

413

414

415

416

417

418

419

420

421

422

423

424

425

426

427

428

429

430

431

432

433

434

435

436

437

438

439

440

441

442

443

444

445

446

447

448

449

450

451

452

453

454

455

456

457

458

459

460

461

462

463

464

465

466

467

468

469

470

471

472

473

474

475

476

477

478

479

480

481

482

483

484

485

486

487

488

489

490

491

492

493

494

495

496

497

498

499

500

501

502

503

504

505

506

507

508

509

510

511

512

513

514

515

516

517

518

519

520

521

522

523

524

525

526

527

528

529

530

531

532

533

534

535

536

537

538

539

540

541

542

543

544

545

546

547

548

549

550

551

552

553

554

555

556

557

558

559

560

561

562

563

564

565

566

567

568

569

570

571

572

573

574

575

576

577

578

579

580

581

582

583

584

585

586

587

588

589

590

591

592

593

594

595

596

597

598

599

600

601

602

603

604

605

606

607

608

609

610

611

612

613

614

615

616

617

618

619

620

621

622

623

624

625

626

627

628

629

630

631

632

633

634

635

636

637

638

639

640

641

642

643

644

645

646

647

648

649

650

651

652

653

654

655

656

657

658

659

660

661

662

663

664

665

666

667

668

669

670

671

672

673

674

675

676

677

678

679

680

681

682

683

684

685

686

687

688

689

690

691

692

693

694

695

696

697

698

699

700

701

702

703

704

705

706

707

708

709

710

711

712

713

714

715

716

717

718

719

720

721

722

723

724

725

726

727

728

729

730

731

732

733

734

735

736

737

738

739

740

741

742

743

744

745

746

747

748

749

750

751

752

753

754

755

756

757

758

759

760

761

762

763

764

765

766

767

768

769

770

771

772

773

774

775

776

777

778

779

780

781

782

783

784

785

786

787

788

789

790

791

792

793

794

795

796

797

798

799

800

801

802

803

804

805

806

807

808

809

810

811

812

813

814

815

816

817

818

819

820

821

822

823

824

825

826

827

828

829

830

831

832

833

834

835

836

837

838

839

840

841

842

843

844

845

846

847

848

849

850

851

852

853

854

855

856

857

858

859

860

861

862

863

864

865

866

867

868

869

870

871

872

873

874

875

876

877

878

879

880

881

882

883

884

885

886

887

888

889

890

891

892

893

894

895

896

897

898

899

900

901

902

903

904

905

906

907

908

909

910

911

912

913

914

915

916

917

918

919

920

921

922

923

924

925

926

927

928

929

930

931

932

933

934

935

936

937

938

939

940

941

942

943

944

945

946

947

948

949

950

951

952

953

954

955

956

957

958

959

960

961

962

963

964

965

966

967

968

969

970

971

972

973

974

975

976

977

978

979

980

981

982

983

984

985

986

987

988

989

990

991

992

993

994

995

996

997

998

999

1000